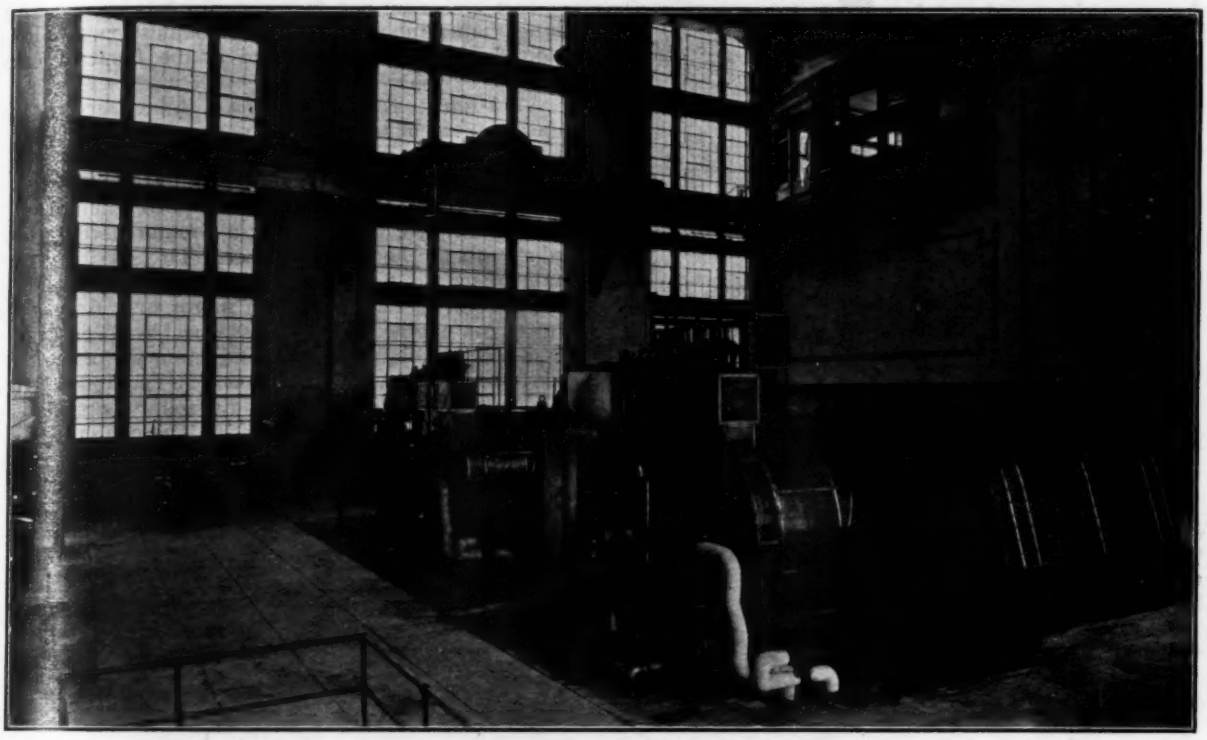
Electrical Review
WITH WHICH IS CONSOLIDATED WESTERN ELECTRICIAN AND ELECTROCRAFT.

VOL. 73—No. 16. CHICAGO, SATURDAY, OCTOBER 19, 1918. PAGE 603.



Turbine Room at Millers Ford.

The Power Station at Millers Ford

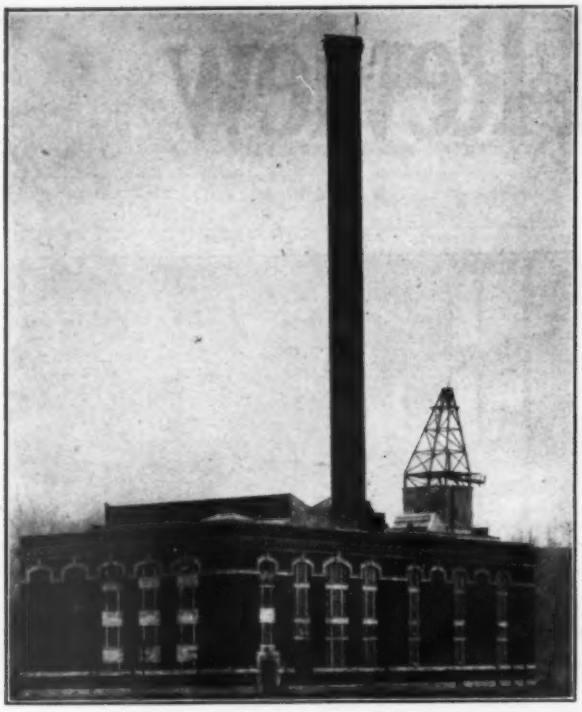
Salient Features of Dayton Power & Light Company's New Plant—Precautions Against Floods, and Labor-Saving Efficiency Refinements, are Prominent Features

Prior to July of this year the Dayton Power & Light Co. operated three power plants. The load served by these plants comprised electricity and also a large amount of steam and hot-water service. After the flood of 1913 Dayton was largely remodeled, at which time the majority of isolated pants went over to central-station service.

The three power plants remained as the city grew and expanded round them, until the time came when inability to keep pace with the load which has increased rapidly due to a large munitions load, difficulties and expense of coal and ash handling and cooling water problems made it necessary to choose another site and erect a new plant. The site chosen was inside the city limits at Millers Ford, on the banks of the Miami River, where there is ample cooling water, good facilities for coal and ash handling, and space for expansion.

The station is of steel and brick construction, finished in red brick, green steel work and cream finished cement, making pleasing harmony with the surroundings. At present two 12,500-kw. turbogenerators are installed, although the ultimate capacity of the station is intended to be 100,000 kw. Much construction work, such as foundations, switch cells, etc., has been done in readiness for future units.

Three boilers comprise the initial installation of 4125 b.h.p. with ultimate capacity of 12 boilers. The boilers are B. & W. cross-drum type, rated at 1375 b.h.p. and operating at 250 lb. gauge and 125 deg. superheat. Each boiler has 674 tubes, 4-in. dia. and 18 ft. long, vertically baffled and arranged in 42 sections, 16 high, with a heating surface of 13,750 sq. ft. A B. & W. superheater is installed with each boiler. A full complement of Vulcan soot blowers is installed per boiler. These consist of 14 rotary transverse elements and 2 stationary elements; 7 rotary elements and 1 stationary element extending half-way across the boiler from either side. The elements from each side are set singly and are operated separately. The



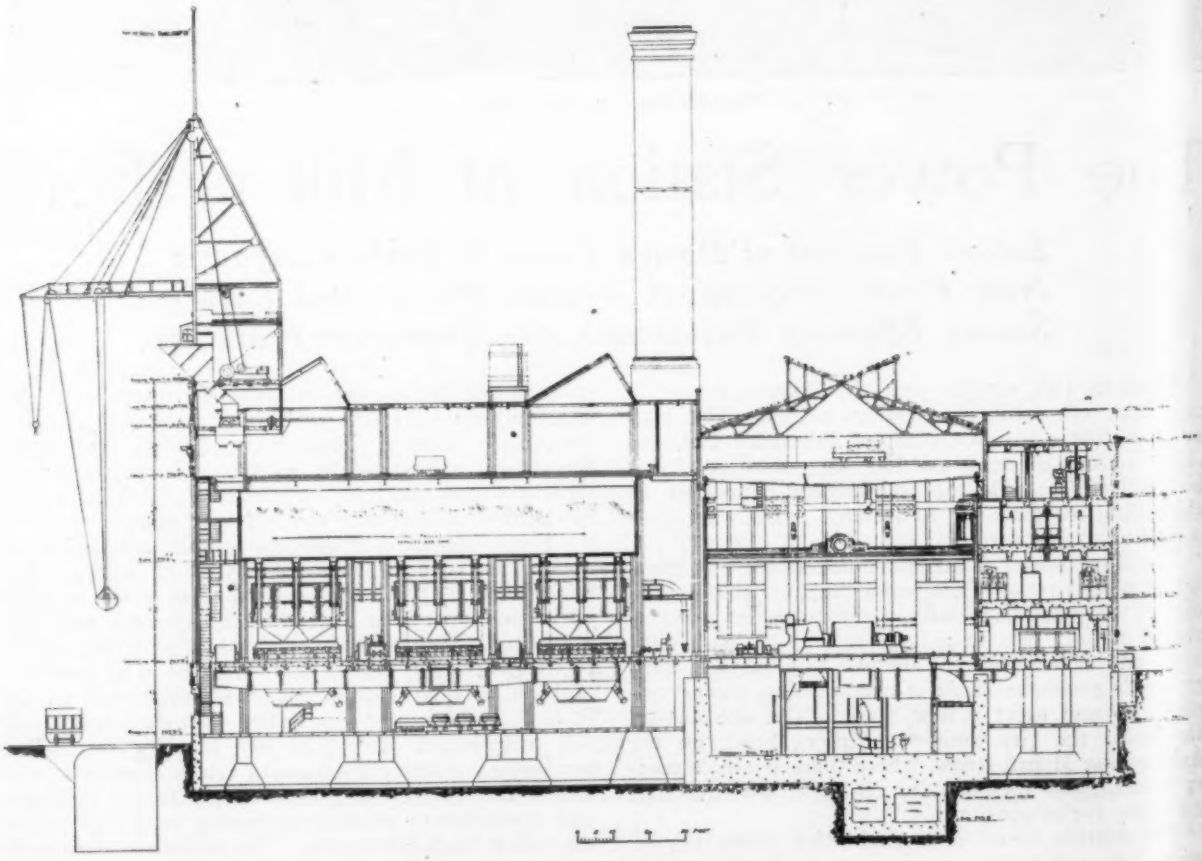
Exterior View of Millers Ford.

feed-water to each boiler is controlled by S-C regulators, and enters from the feed-water heater at 212 deg. F. The total feed-water to all boilers is metered by Bailey fluid meter. Blow-down water is measured by Yarnell-Waring recording and integration V-notch meter.

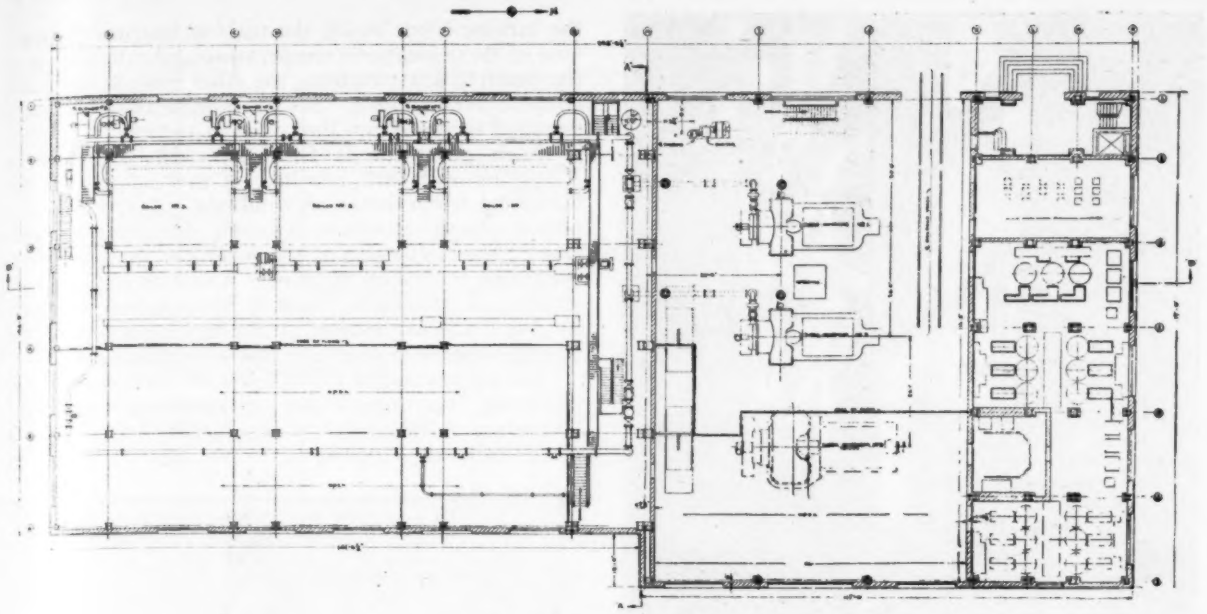
The functioning of each boiler is metered by two recording Bailey meters per boiler, one installed at the front, and one at the rear. These meters are mounted on panels supported on the structural steel channels between boilers. One instrument records steam flow, air flow, steam temperature and draft over the fire. The other records steam flow, air flow, flue-gas temperature and wind-box pressure. Orsats are used for taking snap samples of gases of combustion. A Precision draft gauge is installed at the front of each boiler.

A 14-retort Taylor underfeed stoker serves each boiler, equivalent to 100 b.h.p. per retort. Each stoker has an effective grate area of approximately 3½ sq. ft. per retort, or a total of 490 sq. ft. Each stoker is equipped with the Taylor steam power dump. All three stokers are driven from a countershaft passing underneath the boiler-room floor. This shaft may be sectionalized to permit of being driven by either a 30-h.p. squirrel-cage induction motor or a 6 by 7 in. Sturtevant engine. A Reeves variable speed transmission is installed with both induction motor and engine. Each Reeves transmission is equipped with tachometer for indicating speed of stoker counter shaft and stoker shafts. The stoker shaft is equipped with counter, which by calibration for coal content per retort enables coal consumed per stoker to be determined.

Forced draft is furnished by three Sturtevant multivane fans, each driven by Sturtevant turbine through a reducing gear giving speed reduction from 4200 to 750 r.p.m. These units are installed along the boiler room wall at rear of boilers, directly beneath

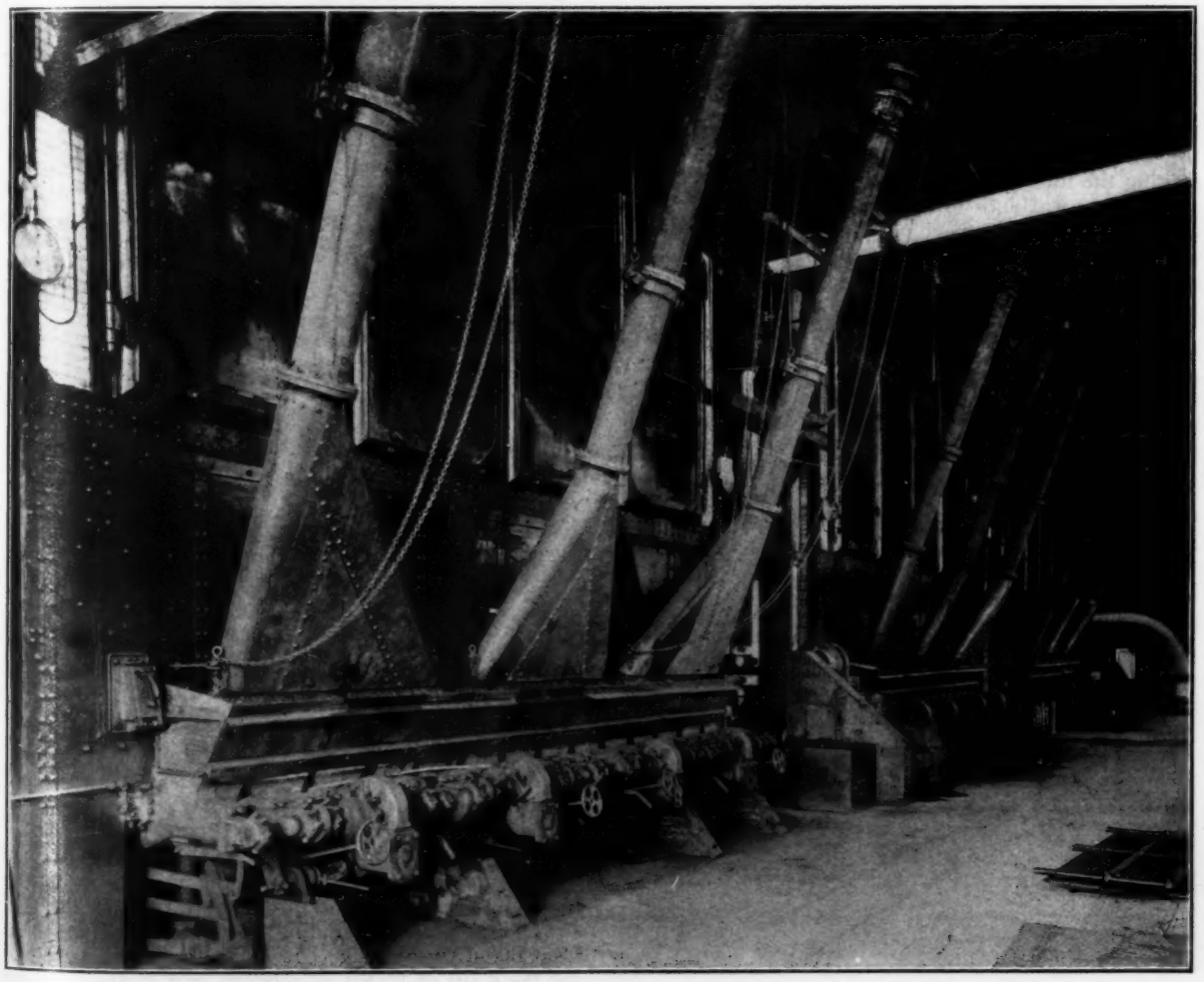


Cross-Sectional Elevation of Millers Ford.



Plan of Millers Ford Station.

the main high-pressure steam header. Any one blower is capable of supplying sufficient air to the fuel beds of all three furnaces to maintain normal boiler output with average grade of coal. An air-balanced valve controls the forced-draft blower speed, harmonizing the supply of air to combustion requirements with changing fuel bed. One stack serves the three 1375 h.p. boilers. This stack is 13-ft. inside dia. and 325 ft.



Underfeed Stokers Driven by Variable-Speed Transmission, Serve the Three 1375-hp. Boilers.

Forced-Draft Steam-Driven Blowers.

high, built up of steel plates and lined its entire length with 4-in. brick lining and about 2 in. of grout.

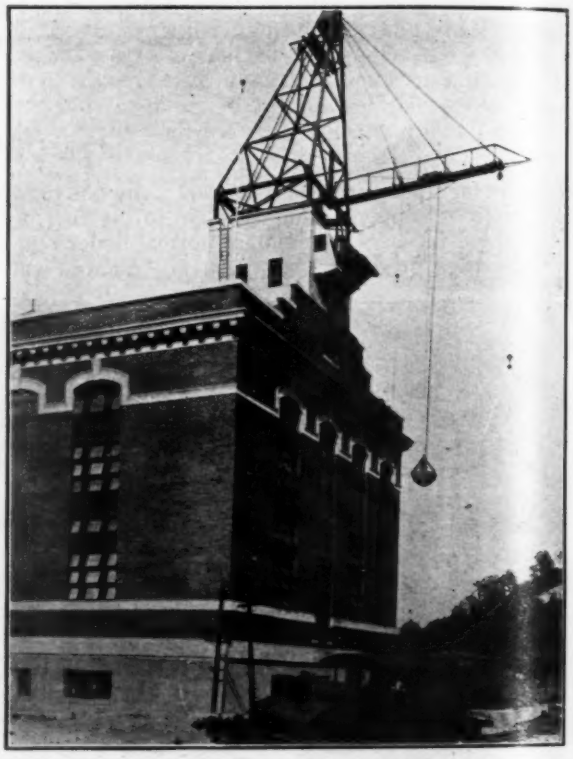
The turbines installed at present consist of two 12,500-kw. units. The station is, however, laid out for three more turbogenerators of 25,000-kw. each, making the total capacity 100,000 kw.

The two turbines now installed are 9-stage, 1800-r.p.m. G. E. Curtis machines designed for operating with steam at 230 lb. pressure and 150 deg. superheat and deliver energy to the generator equivalent to 12,500-kw. at 80% power-factor.

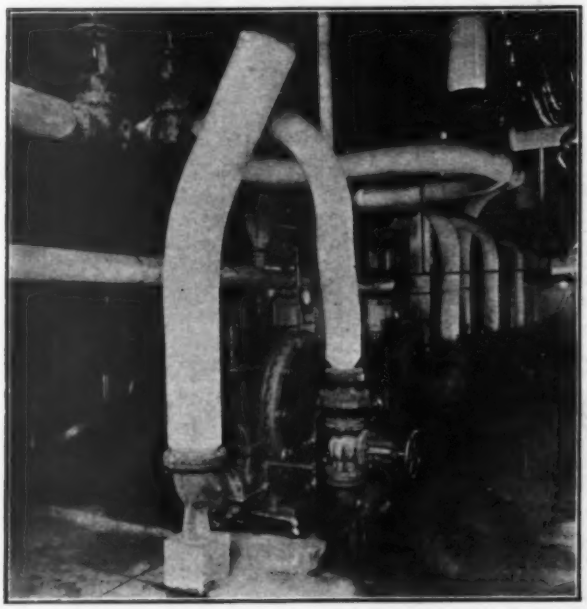
Two Bailey recording fluid meters are installed in the turbine room beside the turbine instrument panel. One of these measures temperature and rate of flow of the steam to No. 1 turbine; the other records feedwater temperature and flow. A Cochrane steam separator is installed in the steam line of each turbine.

Each generator is furnished with air washers. Exploring coils are installed in each stator for determining temperature of windings. A 170-kw. compound-wound, interpole, 250-volt direct-current generator on an extension of the generator shaft furnishes excitation to its own machine. A second source of excitation is obtainable from a Westinghouse turbine driving a 100-kw. exciter on the turbine floor; while a storage battery is available for emergency use.

Each generator is furnished with Metropolitan Engineering Company's air conditioning apparatus. These are installed below the turbine room floor in direct path of incoming generator air. A 5 h.p. in-



Coal-Handling Hoist.



Steam-Driven Pumps.

duction motor operating a 1780-r.p.m. Platt pump delivers 200 g.p.m. under 30-ft. head to the spray nozzles. The generator air passes through separate individual sheet steel ducts. Air discharges either into the station, or outside the station by means of doors furnished for this purpose. The discharge air is routed through a common steel duct having a cross-sectional area of about 56 sq. ft.

Below each exciter, in the floor, is located a terminal board through which the exciter and main generator leads pass. This board enables all leads to be readily accessible for inspection, and for manipulation in times of emergency, repair and trouble.

The boiler room auxiliaries are installed below the boiler room, somewhat below the maximum water-level attained by the Miami River during the flood of 1913. To prevent flooding special precautions have been taken to make the basement floodproof by building the walls of layers of concrete and minwax sealing compound.

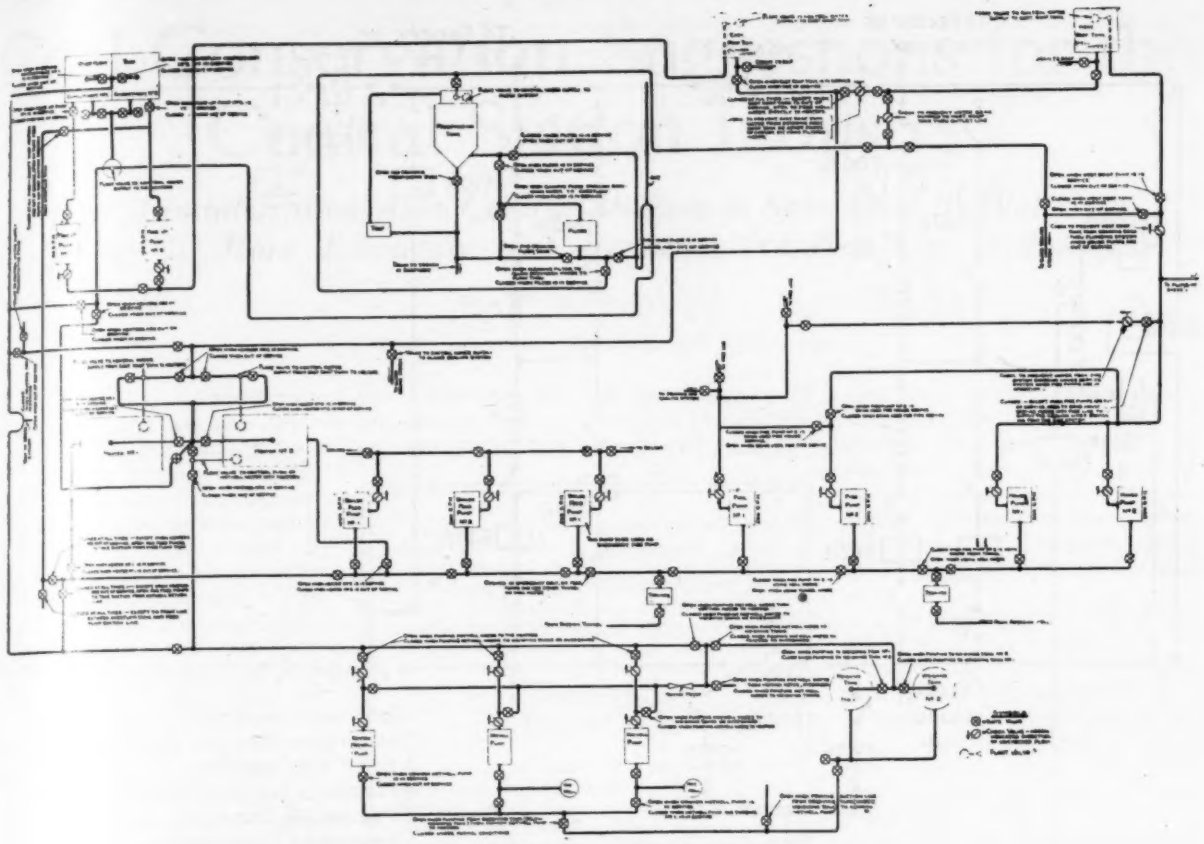


Diagram of Water Piping System at Millers Ford.

A Westinghouse condenser of the radial-flow type is located beneath the turbine it serves. These condensers have 3043 1-in. 18 B.W.G Muntz tubes of 18 ft. 10 in. active length, making a cooling surface of 15,000 sq. ft. With 18,000 g.p.m. circulating water at 75 deg. F. passing through them, equivalent to a velocity of 5.7 g.p.m., these condensers are able to condense 164,000 lb. of steam per hour. A 150-h.p. Westinghouse squirrel-cage induction motor drives each centrifugal circulating pump which when operating at 700 r.p.m., delivers 18,000 g.p.m. The LeBlanc and 600-r.p.m. hotwell or condensate pump of each condenser are connected to the same shaft, which is driven through a reduction gear by a 3500-r.p.m. Westinghouse turbine. A separate turbine-driven centrifugal pump, discharging into a weighing tank, is available for weighing the condensate during test and at times of emergency.

Three centrifugal pumps, two delivering 500 and one 1000 g.p.m, handle the boiler feed-water. Two 500-g.p.m. centrifugals furnish fire protection while two more, each with a capacity of 200 g.p.m., supply the house service. All these pumps were furnished by the Platt Iron Works, and are steam driven by Sturtevant turbines. A 60-h.p. Sturtevant turbine drives a centrifugal sump pump installed above the auxiliaries floor in the basement, and so located as to take care of rising water should the Miami River rise unduly, as occurred in 1913.

On the same floor with the boiler room auxiliaries is a Platt open-type feed-water heater with capacity for 10,000 b.h.p.; two air compressors for supplying air for cleaning purposes, back-washing the sand filter and pneumatic tools and similar work are also here.

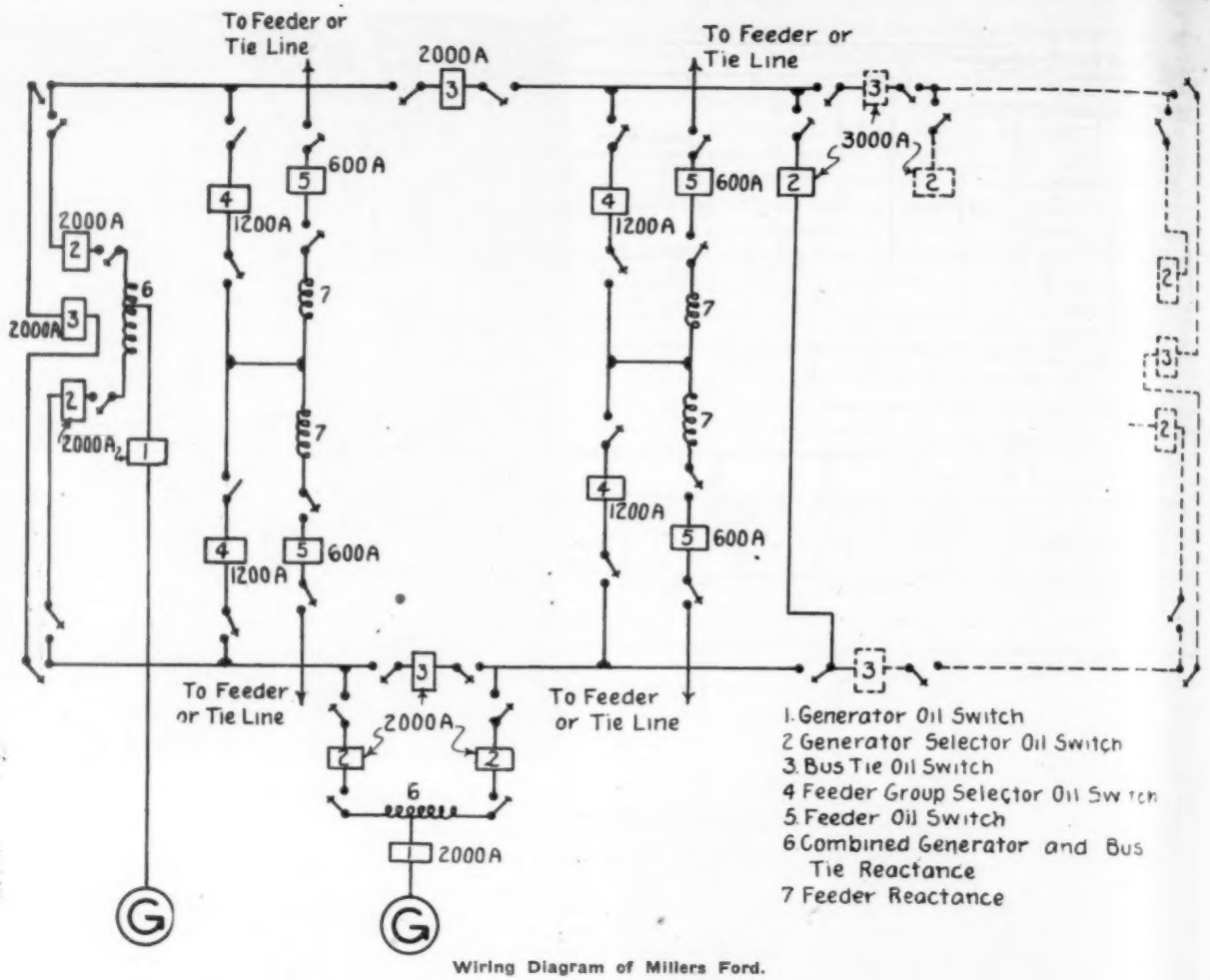
Two water-storage tanks of 10,000 gallons each are located on the roof and supply by gravity the boiler feed lines and house service respectively. Water is pumped automatically from the condensate overflow tank in basement to roof stand-by tank by a centrifugal pump working under 110-ft. head. The condensate overflow tank has capacity for 20,000 gallons.

Water softening is accomplished by a system having capacity for treating 3000 g.p.h.

The steam header will eventually form a ring, of which less than half has as yet been constructed to care for the two existing turbines. The main steam header, 15-in. dia. inside, is controlled by Chapman valves, each of which is equipped with Dean control, permitting operation by direct-current motor off station storage battery from both turbine and boiler room. All boiler stop valves are chain operated. All steam and hot water piping is heavily covered with 80% magnesia.

Coal is picked up by a Mead-Morrison engine-driven hoist with capacity of 40 tons hourly. Coal is dropped from the grab bucket into the crusher hopper, thence through a Mead-Morrison crusher, driven by a 35-h.p. induction motor. From the crusher the coal passes to a 2½-ton cable car, operated by a 7½-h.p. induction motor. A Fairbanks-Morse scale of 9000 lb. maximum capacity weighs all coal in the cable car. One brick-lined hopper serves all stokers, although any portion can be partitioned off at any time. This hopper has a capacity of 950 tons. Ashes are dumped out of the ash hoppers by gravity and are taken away in mule-hauled cars or storage battery locomotive to the yard where they are used for filling.

The location of the various apparatus can be seen from the cross sectional elevation of the station. The generator circuit breakers and reactances are installed on a level with the turbine floor, in the section of the building containing the electrical apparatus. The cir-



Wiring Diagram of Millers Ford.

cuit breakers are Westinghouse, 2000-ampere, 23,000-volt switches. The generator leads consist of two 1,000,000 c.m. conductors in parallel, insulated with 10/32-in. varnished cambric, treble-braided. These reastances are arranged to function as generator and bus-tie reactances, as shown in the station wiring diagram. The station power and lighting transformers are installed on the same level as the turbo-generators. Station power is furnished by two banks of three single-phase 300-kw. 6600/230-volt oil-cooled transformers, while the lighting is carried by two 200-kw. single-phase units. In the secondary leads of each of these transformer banks is installed a one-to-one induction regulator in combination with a series booster for maintaining constant voltage, irrespective of voltage changes in main bus voltage, for station lights and motors, thus conserving lamp life and enabling efficient motor performance and sustained capacity.

Benchboard and Feeder Panels.

From the generator circuit breakers and reactances the main leads pass up to the bus structures on the second floor. From here the various feeders emanate to the feeder structures on the floor above, at which level are the switchboard and benchboard and operating gallery. On the fourth floor is the lightning arrester room, and the kitchen for employes. At present the 6600-volt feeder lightning arresters, six in number, are installed on the feeder rack outside the station, the feeders passing up the wall in vertical runways, emerging through it to the rack. At present six 6600-volt three-phase circuits leave the station. From the station these go to a steel rack outside the station carrying choke coils and arresters.

From the operating gallery a view of the entire turbine floor is obtained. In this room is the benchboard for generator control and the feeder panels. A third switchboard carries recording meters, pyrometers of the generator exploring coils and various auxiliary apparatus. All switchboards are of blue marble and were furnished by the Westinghouse Co. Benchboard panels have been installed for the ultimate generating capacity of the plant. A Warren clock is installed in the operating gallery for standardizing the frequency and assisting synchronizing with the company's other stations.

Coal Conservation Suggestions for the Central Station Industry

Fuel Administration Asks Central Stations to Save Coal By Not Only Using It More Efficiently, but Reducing Needless Use of Energy

By P. B. NOYES

Chief, Coal Conservation Division, Fuel Administration.

The war has made necessary the furnishing this year of 634,594,000 net tons of bituminous coal in order to feed our factories and keep our population warm. The increase demanded in bituminous coal is 79,866,000 net tons and this must be met by increased production and by greatly reduced consumption. The largest percentage of increase in coal consumption is called for American ships sailing for foreign ports. The Shipping Board has estimated that to supply bunkers to ships in foreign trade will require 30% more coal this year than last. Industry augmented by the needs of war calls for 18% more fuel than in 1917; public utilities call for a 15%, domestic consumers for a 13% and railroads a 7% increase.

We must not expect the items in this estimate to be entirely stable, for new conditions and emergencies arise continually. It is possible, even probable, that demands will exceed our present anticipations.

If we cannot get out of the earth the amounts of coal which we must have to win this industrial war, this war of steel, what remains to do? Conservation is our resource and, fortunately, an ample one if the public with undivided patriotism co-operates in the program. The conservation which can be accomplished in the operation of public utilities opens a wide field. This program is under the direction of the Power and Light Division of the Bureau of Conservation of the United States Fuel Administration.

In the following columns is a message from the Fuel Administration to the central-station industry to save coal. There are between 25,000,000 and 50,000,000 tons of coal that could be saved in the power houses of the country by improved methods of use. And much more could be saved by reducing the consumption of energy derived from coal. The central-station industry can play a large and vital part in saving this coal.

Coal is necessary for winning the war. The fireman's firing line is at the furnace door. The central-station manager's firing line is where he can supervise, improvise and improve methods of using coal and in the use of the energy derived from coal. The fireman is the private, the central-station superintendent or manager the commanding officer, conversant with all details, all matters of strategy, and controls the actions of his men and the policies of his organization.

The fireman in the boiler room can save coal only insofar as he is given opportunity and encouragement. The central-station manager can enable coal to be saved all along the line from where converted from latent into electrical energy and in the many uses for that energy.

The coal situation is a tense one pregnant with difficulties, faced with heavy odds. It can be conquered victoriously only by intense effort, sustained purpose, strong resolve and sound strategy. Every coal user is a soldier in the army of coal savers. Every central-station manager carries a heavy and sacred responsibility in this cause. Accept it, and execute it successfully. Save coal.

The "Skip Stop."

One of its measures is the establishment of the skip-stop system on street-car lines, which as it has spread from city to city and gone into operation in entire states is conserving large amounts of electric current and, therefore, of coal. With the reduction of the number of stops from an average of twelve to fourteen a mile to eight in the business section, six in the residential and four in the open country, a fuel conservation of 10 to 15 per cent results. When this measure is adopted by all cities in the United States with a population over 25,000, the result is likely to be a coal supply of 1,500,000 tons saved for the war machine. The co-operation of railway companies, various municipal authorities and state commission is bringing about nation-wide adoption of the system.

The power required for starting a car is six or eight times as great as that required to keep it in motion. A considerable part of the power for operating street cars is due to the frequent stops which the cars make. The skip-stop system not only brings about this saving in fuel at a time when our nation is facing a dangerous fuel shortage but it also brings about an actual improvement of the service of the street railway companies. The elimination of stops enables the street cars to move their passengers to their destination more rapidly and with more comfort. For instance, in Minneapolis the length of the usual 40-minute car trip has been reduced to 25 minutes.

The skip-stop system does not contemplate putting stops so far apart as to be unduly burdensome. The Fuel Administration has requested that there should not be more than 8 stops per mile (average 660 ft. apart in business districts); 6 stops per mile (average 880 ft. apart in residence districts); and 4 stops per mile (averaging 1320 ft. apart in open country). Before starting the skip-stop system it is suggested that a board consisting of five members be selected; two representing the city, two the railway and hte fifth a representative of the Fuel Administration. The city members should obtain the views of the police and fire departments regarding dangerous points of traffic, providing they exist. The duty of this board is to select the car stops and see that the instructions regarding the stop-marking, advertising and general policy are carried out that the public may be given the adoption of this system by voluntary co-operation of best service with maximum fuel economy.

The United States Fuel Administration desires the

public-service commissions, municipal authorities, city commissions and street railways. Since the actual fuel saving is so great in the aggregate, every citizen who is a car user will desire to have a part in this saving and to use his influence to effect the maximum saving.

All mayors and those in authority are urged to have ordinances passed to keep vehicles off car tracks and keep the tracks clear of obstructions. In this way traffic will be accelerated and much time saved for the community. These extra stops waste power. It is also well to have the railway management and the city authorities make every effort to eliminate all stops on cars going up hill and around curves. Every effort should be made to see that stops at these points are reduced to the absolute minimum, as excessive power is required for this operation.

All municipal authorities are urged to do everything they can to reduce the number of stops made by the interurban cars, especially within city limits. In a number of cities, ordinances require these large cars, or in some cases, trains, to stop at a number of street intersections. These large cars require three to four times more power to start than do city cars of moderate size.

In adopting the skip-stop system as a fuel-saving measure during the war, there are three fundamental principles which must be observed in order that the proper results may be assured. These are:

(A.) The system must be applied to the entire city, including the business district as well as the residence district, and not merely the latter.

(B.) The stopping points must be located so as to serve the people to the best advantage rather than to secure uniform spacing or to follow any arbitrary rule. This may bring some of the stopping points on the near side of the street, some on the far side, and some in the middle of a block. It is better, however, to have such a diversity, with the points properly located, than to have uniformity if convenience of location is sacrificed to secure this result.

(C.) The number of stopping points must not be too great. There should be not more than eight per mile (averaging 660 feet apart) in business districts, six per mile (averaging 880 feet apart) in residence districts and four per mile (averaging 1320 feet apart) in the open country.

The remarkable improvement in the service which has been effected in Washington by the skip-stop system has been largely due to the proper observance of these regulations.

In addition to the general principles cited, which may be regarded as fundamental, there are a number of other items which should be carefully considered in each case, but which, on account of local conditions, may or may not apply. These are:

(1.) If the system is inaugurated gradually instead of all at once, it is preferable to put it into effect first in the congested downtown districts where a number of lines converge and to make it apply to all of the lines in that district. This will effect an immediate improvement in service on all of the lines and will prepare the way for a greater improvement when the system is extended.

(2.) The stopping points should be plainly marked, preferably by signs bearing the words "Car Stops Entrance" or some similar designation which will be clear to any one rather than merely by a colored stripe on the pole or other designation which is not self-explanatory.

(3.) There should be a sign in each car giving a list of the points at which stops are made, where this is practicable, or, where this is not practicable, calling attention to the fact that the car stops only at certain streets and suggesting that passengers find from the conductor the nearest stop to their destination.

(4.) Where lines diverge, the stopping points should be located so that the stopping of cars of one line will not hold back cars of the other line. A typical instance is where one line continues on a given street while a second line follows the same route for a portion of the distance and then turns into a side street. In such a case, if the cars of the first line stop in both directions beyond the point where the second line turns off and if the cars of the second line stop in both directions on the street which they alone use, the above object will be attained.

(5.) In many cases a staggered arrangement of stopping points, so that if the cars bound in one direction stop at First Street, Third Street, etc., those bound in the other direction will stop at Fourth Street, Second Street, etc., will distribute the advantages of the system in a more equitable manner among all of the patrons than an arrangement by which the cars stop at a given point in both directions and skip the next former stopping point entirely. There are other cases, however, where this arrangement is not practicable.

(6.) In connection with the introduction of the skip-stop system the matter of safety stops should be carefully reviewed. There are many points at which cars are now required to come to a standstill where equally safe operation can be obtained merely by having them slow down to a speed of five or six miles per hour.

(7.) Where interurban cars enter cities, it is desirable that they should not be required to stop at every city car-stopping point (since such cars require much more power for starting than city cars) but they should stop not oftener than every quarter mile. This can readily be arranged for by the use of special signs at the interurban car-stopping points.

(8.) By observing the above policies it is ordinarily possible, when introducing the skip-stop system, to reduce the number of stopping points on city lines by from 30 to 40%. This usually reduces the number of stops actually made by about 25%. Under these circumstances the schedule-speed of the cars can, as a rule, be increased by from 10 to 12% (without any increase in the maximum speed) while at the same time the power required (and hence the fuel) is reduced by a corresponding amount.

(9.) It has been more or less common, in introducing the skip-stop system, to begin with one or two lines and to reduce the stopping points only in the outlying sections, making all stops as usual in the business district. Such an arrangement does not give satisfactory results from the standpoint of either fuel economy or improvement in service. It is in the effort to avoid the introduction of the system on such a basis in any future cases that we are calling especial attention to the above principles which it is necessary to follow in order to secure the desired results.

(10.) Where single track is operated it is suggested that every other corner be skipped; that is, assuming that the streets are numbered 1st, 2d, 3d, 4th, 5th and 6th, to have the stopping places shown at 1st, 3d and 5th streets. In this way, confusion with reference to the placing of stop-signs will be eliminated. This will reduce confusion in knowing where the car stops are located.

(11.) All stops should be carefully marked. Where it is necessary to start the skip-stop system immediately and regular signs are not ready, in a number of cases temporary signs are used.

(12.) Previous to starting the skip-stop system the fullest publicity should be given to the established stopping places. This should appear in the daily papers supplemented by notices placed in the cars whenever practicable.

Central Station Instead of Private Plant.

The purchase of electric power from central stations is often more economical than its generation by private plants. Burned in a large central station one

ton of coal often produces at least four times as much power as it would in the average small plant. In these cases, therefore, economy of fuel can be effected without the slightest loss in light and power.

A letter from the owner of a Brooklyn factory typifies the general feeling of those who have made the experiment. It says: "Our electric plant consisted of four generators, with a total generating capacity of 380 kw. and 600 boiler h.p. In addition to generating electric power, we used steam in winter for heating our building as well as a limited amount of such steam all the year for heating wax and other manufacturing purposes. During the year 1912, when our plant was in full operation, we burned 3575 tons of coal and generated approximately 567,300 kw-h. During the year 1915 under central-station operation we burned 1072 tons of coal for heating and other manufacturing purposes and in addition purchased 496,220 kw-h. If we figure the coal burned at the central station as 2½ pounds per kw-hr., the total amount burned on our account during 1915 is then 1692 tons, thus showing a saving of over 50 per cent. We have found also that our total cost for steam and electric power with central-station service is less than it was when we operated our own generators and we are glad we made the change."

To follow the recommendations of the Fuel Administration, therefore, will not involve losses or great inconvenience to those who thus volunteer for the Conservation Army. Nor will central stations benefit unduly from the new loads. The expenses of the interconnections fall upon them and as the arrangement is for the period of war necessity only, the compensation will be not more than adequate. It has been determined in round numbers that there are between twenty-five thousand and thirty thousand private generating plants in the country. In a few important centers, such as New York, Chicago and Detroit, about one hundred of these have shut down, resulting in a probable saving of more than 150,000 tons a year.

Chicago reports twenty-five plants closed since the first of January, saving 55,000 tons a year; New York enters second with a story of fifty plants closed and a saving of 45,000 tons. In St. Louis eight plants are purchasing electrical energy instead of generating it, accomplishing a saving of 10,000 tons. One firm alone in New York has conserved, in its annual fuel consumption, 50 per cent of its fuel or the equivalent of 400 tons.

Another phase of the same principle is the closing of inefficient plants in favor of the more economical ones at periods of reduced productivity and where they serve practically the same communities.

Other Sources of Saving.

The Power and Light Division, working in cooperation with the Joint Commission on Refrigeration which was organized to assist the Government during the war, is planning effective conservation in the ice and refrigerating industry.

It may prove wise to allot coal to these plants on the basis of a 10 to 15 per cent reduction from last year's consumption, this curtailment representing the waste which has occurred systematically. The elimination of the process by which ice is cleared and made transparent would effect a fuel saving of from 5 to 20 per cent. In winter many plants could be shut down which in summer necessarily would operate. Their owners should be protected against loss by the opportunity to buy at wholesale rates from the plants yet busy.

Forty-seven industries, consuming according to the census of 1914, 200,000 tons of coal annually, offer a possible opportunity for coal limitations. These industries are classified as manufacturing equipment and supplies, house furnishings, building materials, necessary apparel, luxuries, and miscellaneous products. In this latter division ice is included.

The proper use of lights and of power in factories offers another opportunity for saving fuel. The Administration suggests that every factory appoint a shop committee which shall familiarize itself with all details which might contribute to economy in fuel, and make its reports to the head of the plant. Among the details in regard to light in which this committee should interest itself are the burning of just the adequate number of lamps; the installation of lights not higher in candlepower than is justified by the use to which they are put; the installation of tungsten lamps in place of the more wasteful ones of carbon filament, and of nitrogen-filled lamps in place of arc lights. The more frequent washing of windows would result in a brighter stream of daylight and the consequent reduction of artificial lighting. Power may be saved by the stopping of motors when machinery is idle, by the grouping of machines so that at times one machine can carry the load of two or more; by the elimination of erratic speed, of slipping belts, dry bearings and underheated and overheated parts. Moreover, such untechnical expedients as the weatherstripping of doors and windows and the closing off of staircases against unnecessary drafts will accomplish considerable saving of fuel in factories.

The conservation program has been thought out clearly and based upon carefully prepared statistics. It involves no hardships and very slight inconvenience. The farther conservation can be carried the freer the public will be from fuel restrictions. But more appealing than any guarantee of personal comfort is the assurance that every five tons of coal which we save will produce one ton of finished steel and steel is the power behind our men.

COAL MINES NEAR SEATTLE ARE BEING ELECTRICALLY EQUIPPED.

The Raven Coal Co., Seattle, Wash., is equipping a mine at Ravendale, Wash., with steam and electric facilities to supply power and light at its mine and to light the town. The equipment consists of a 150-hp. boiler and a 100-kw. direct-current generator, for operating a 3-wire system of 250 volts for mine power and 125 volts for lighting. In addition to the usual equipment this plant has a Jeffery electric locomotive, a traveling picking table, shaking and revolving screens, all motor operated. The improvements also include a washing plant of the Elmore design, electrically driven, the capacity of which is 80 tons per hour. By Jan. 1 this mine is expected to be producing 300 tons of coal per day.

The Central Coal Co., under the same control as the Raven, is installing at its Grand Ridge mine a 50-kw. motor-generator set for producing direct current required for hauling and other power; in this installation a 150-kw. synchronous motor is used for driving the generator set. Other electrical installations being made comprise a Jeffrey 7-ton locomotive, a ventilating fan driven by a 7½-hp. motor, and rotary coal-dumping equipment. Considerable of the equipment at the Raven mine was supplied by the Industrial Machinery Co., Seattle. The Central company buys central-station power.

Steam Turbine Development and Tendencies

Rapid Development of the Turbine in the Past is Giving Place to Gradual Refinements Affecting Economy, Reliability, Safety and Increased Capacity

The rapid strides made in central station practice in this country have brought about many developments of turbines for land purposes in sizes that have gone beyond European practice, and very remarkable steam engine performances have been obtained by the principal manufacturers. Very material advances have been made in the development of the high-speed alternating-current generators, which have permitted turbines to be designed more appropriately for the volumes of steam involved. Today, 5000-kw., 60-cycle machines have been built for operation at 3600 r.p.m., while in the year 1900 electrical engineers looked askance at such speeds even for 500-kw. units, and regarded 1800 r.p.m. as the more desirable speed for this capacity and frequency. Improvements in condensing apparatus have also contributed to the development of the turbine, bringing ordinary available vacua from 26 in. to 29 in.

Early turbines had their low pressure elements designed for vacua not much over 26 in. Today, all turbines are designed to expand steam at their point of best steam consumption to 29 in. vacuum.

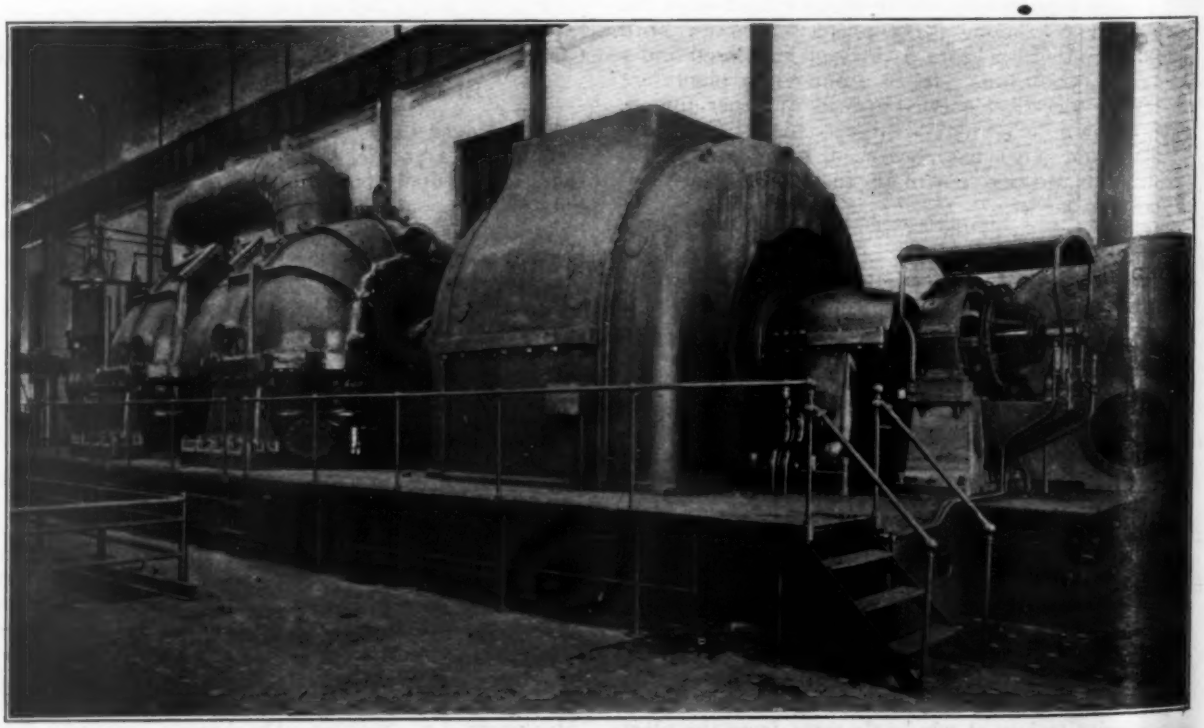
Today the maximum capacities of generators at given speeds are as great as the capacities for which the turbine can be conveniently designed. In other words, the turbine ceases to be a machine of too high speed for general application. It may be designed for its best speed and connected direct to the generator in the case of alternating-current machinery for all but the smaller sizes below 500 kilowatts or connected through toothed gears to other types of apparatus.

While vast strides have been made in turbine progress, effort is still being made toward improvements in matters affecting economy, reliability and safety. Reference to future possibilities is interesting.

All machines are now provided with automatic stops, the main throttle valve itself being arranged to be operated automatically by the stop governor. The advantage of such an arrangement is that the valve must necessarily be maintained tight; second, it must be operated every time the turbine is started or stopped; and third, the valve may be partially closed even while the turbine is operating, so there may be assurance of no sticking in the pistons, etc. Valve seats of monel metal appear to be most capable of resisting the erosive action of steam.

More attention is being given to the exhaust passages of turbines, that the steam may leave the turbine without eddies in the exhaust chamber. The hot and cold spots with the turbine operating under light load operation, and particularly on a change of vacuum, doubtless inducing considerable temperature strains of older designs have been eliminated. Some later large machines are projected with "stream line exhausts," the steam being divided up, as it leaves the last row of blades, into a number of easy curved passages leading to the exhaust opening.

With high-speed machines, the exhaust passages



A 35,000-kw. Westinghouse Tandem-Compound Turbogenerator.

have greater physical dimensions than anything else about the machine, the turbine almost appearing to be all exhaust chamber so any further reduction in diameter in the inherent turbine parts, will not materially affect the dimensions of the whole turbine.

Progress and Future Possibilities.

It is plain that with turbines of large size, which deliver to the switchboard 76 to 80% of the theoretical energy available from the steam expanding between the limits specified, further improvements in the turbine itself will not materially raise this efficiency, and that further improvement in central-station economies must be looked to from causes other than the steam turbine. This is a subject of the greatest importance in view of the rapidly increasing cost of fuel and justifies considerably more capital expenditure for economizers and other plant apparatus which will reduce fuel cost.

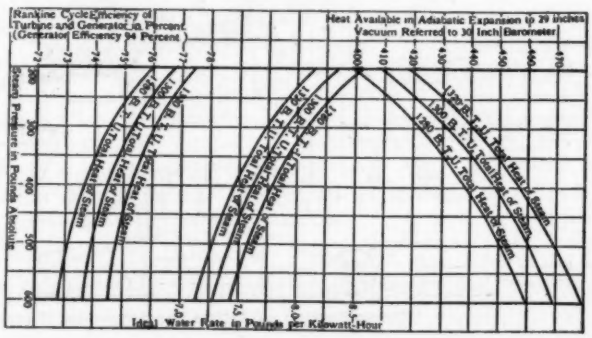
Attention at the present time is being directed to employing higher boiler pressures, viz., pressures as high as 600 lb. Today 200-lb. pressure, 200° F. superheat is regarded as a more or less every day operating condition for large plants. Steam generated at 600-lb. pressure, having exactly the same heat content as that contained in 200-lb. pressure and 200° F. superheat, will have a superheat of approximately 128° F. This expanded to 29 in. of vacuum is theoretically capable of giving 13% more energy than when generated at 200 lb. Doubtless, when operating under these conditions, the turbine will be of lower efficiency. The high pressure element will be less efficient on account of the great density and the small volume of steam, and, on the other hand, the low-pressure elements will be less efficient because of the great amount of water precipitated by the steam expansion from the high pressure, introducing a brake in the turbine. However, it is reasonable to suppose that the turbine will avail itself of at least 50% of this 13% possible, producing a net saving of 6 or 7%. What may be expected to be derived from higher pressures is exhibited in the accompanying curves, plotted for various pressures.

Another source of improvement of performance in large multiple-cylinder machines may be obtained by intermediate reheating, the steam expanding from a high pressure and superheat through a high-pressure element to a pressure of, say, 40 lb. absolute, where nearly all the superheat has disappeared; the steam then being passed through a separately fired superheater and raised to approximately its original temperature, thus giving a nearly dry cycle to the whole steam expansion. The addition of an intermediate reheater to such an installation would be expected to secure an improvement in total B.t.u. supplied, of 3%. Until lately, however, the capital expense involved would hardly have been warranted.

Much more than formerly, attention is being given to the subject of feed-water heating and means are available for providing a heat balance between the feed-water heating system and the main turbine unit, valves being provided which will take steam from the turbine whenever there is a deficiency of auxiliary exhaust steam for heating feed-water and take steam from the heating system when the feed-water heater is incapable of condensing all of the exhaust steam from the auxiliaries. Valves are also available which, when the conditions demand, will take steam from a higher pressure stage of the turbine in one case and admit steam to a lower stage in the other.

A heat balance system has been proposed, employing electric motors for driving the auxiliary machines, and these, in turn, operated by a special generating unit, the generator being driven both by a non-condensing steam turbine and an electric motor operated from the main busbars, the flow of steam to the turbine being controlled by the pressure in the exhaust and, hence, by the needs of the feed-water heater. At times of excessive demands for feed-water heating, the motor may give energy to the system and conversely when there is a small demand for steam for heating feed-water, the energy for driving the auxiliaries will, in part, come from the main units. The auxiliaries, being motor-driven, have the advantage of reducing the general dirtiness, heat and overcrowding to be found in the basements of many power plants on account of the steam and exhaust piping of the many small turbines. The general prejudice against electric motors for the other auxiliaries would seem to be giving way in view of greater ruggedness of electric motors and the safety of their circuits. The heat energy actually required to operate the auxiliaries with such a system would be far less on account of the better performance of the large turbine unit as compared with the number of small non-condensing auxiliary turbines, in spite of the electrical losses involved.

Further economy may be expected by making more extended use of the economizer. Until lately it has been considered difficult to operate economizers successfully if the feed-water is admitted to them at temperature much below 200°, because of corrosion of the surfaces and the condensation of tarry compounds from the fuel. It is probable that in the future econo-


Rankine Cycle Efficiency of Turbine and Generator in Percent (Generator Efficiency 94 Percent)
Heat Available in Adiabatic Expansion to 29 Inches Vacuum Referred to 30 Inch Barometer
Steam Pressure in Pounds Absolute
Ideal Water Rate in Pounds per Kilowatt-Hour
150 lb. 97° F. Superheat
150 lb. 197° F. Superheat
150 lb. 297° F. Superheat
150 lb. 397° F. Superheat
150 lb. 497° F. Superheat
150 lb. 597° F. Superheat
150 lb. 697° F. Superheat
Dry Saturated Steam
Theoretical Efficiency of Steam
Theoretical Heat Required
Actual Heat Required

Effect of Steam Pressure Upon Turbine Performance.

mizers will operate well with the water entering them at 120° or thereabouts, the water being heated to this temperature by a fewer number of steam-driven auxiliaries or by the employment of electrically-driven auxiliaries entirely and bleeding the main turbine at a stage where the pressure is commensurate with that temperature.

The present time is a very important period in the development of the steam turbine. A large number of big units have been built ranging in size from 25,000 to 60,000 kw. Those built by the General Electric Co. are of the impulse type, those by the Westinghouse Co. entirely of the reaction type, and sometimes a combination of both types, where the complete expansion is carried out in a single cylinder. Of the Westinghouse machines, the increased reliability obtained by dividing the steam expansion in separate cylinder structures is recognized. Some have been arranged with the high and low-pressure cylinders arranged tandem fashion, driving a single generator. Others are arranged "cross compound," each turbine element driving a separate generator. The very largest sizes are of the three element design, comprising one high-pressure turbine, with a low pressure turbine on either

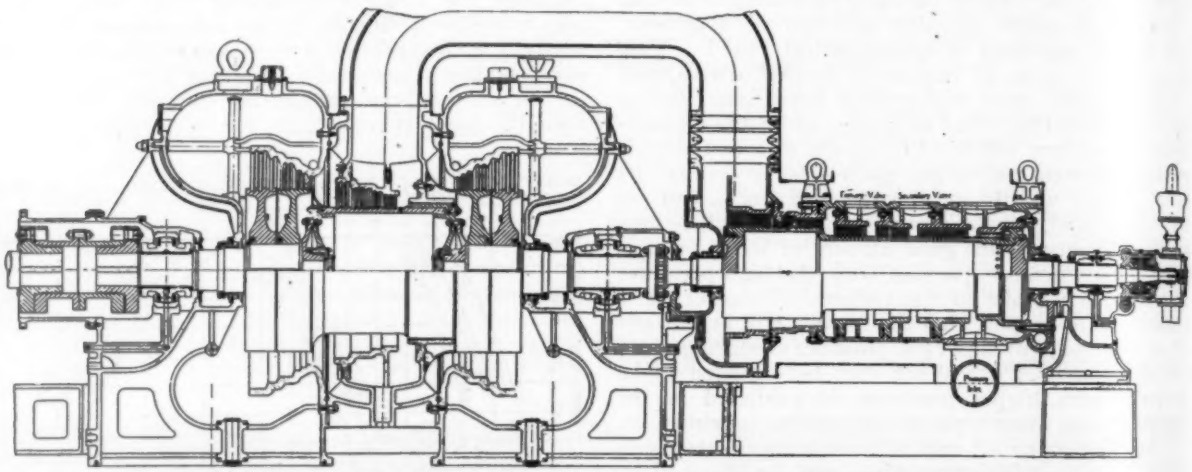
side, each of the three elements having its separate generator.

Many such units are now in operation, and within another year many more will be in service. Some of them will be tested for steam efficiency. All of them will give evidence as to their reliability of operation and accessibility for inspection and repairs. The multicylinder turbine certainly seems to have much to commend it, if there is anything in the thought that with increase in the capacity of the prime mover, there should be a corresponding increase in reliability. These very large units, if built in a single cylinder structure, impose grave problems of design, for as the structure becomes larger, the more likely it is to change shape under the varying temperatures within its walls. Also, the hazard is introduced of using higher grade materials, to deal with higher stresses, with all the uncertainty which that question involves in the actual securing and testing of such materials, without absolute knowledge that the quality of the test specimen will be secured approximately in the finished piece, and there is a certain hesitancy in doing this.

We then have the increasingly imminent question of dealing with higher steam temperatures, which does not make the design of turbines any easier, as is well proven in several recent instances. So, if we take advantage of the fact that in size alone resides an ability to achieve higher efficiency, then it would seem that the uncertainties of design and construction as regards heat stresses, as well as centrifugal stresses, can best be removed by introducing no new questions. Let us have the high efficiency that comes with large size as being within well-tried practice, dealing with no special materials, avoiding widely differing temperatures within the same structure, keeping the high temperatures within the relatively small high pressure element, and be ready, also, for the still higher temperatures of the future. The multicylinder arrangement occupies more room, measured in the width of the unit, but less in length; however, the turbine room space in this respect is not a problem in most stations. They have the advantage, previously pointed out, that the turbine elements permit of being operated separately in the event of derangement of either one of them. Automatic apparatus is provided when demanded for any two of the three turbine elements continuing to carry load should the one be taken out of service, either by the opening of the circuit-breaker or by tripping the emergency stop.

The compound unit costs more money, but not prohibitively more, if the construction behind its adoption is justified by experience. In view of the present power house costs, there would seem to be no economic need of reducing the cost of the turbine units below the amount required to make them as nearly perfect as possible. It is hoped that the time is not far distant when the turbine designer will not have to initiate quite so much as he has in the past; that on the operating side the engineers will test their turbines more generally, will know precisely what results they give in steam consumption, and will take a stronger position respecting the mechanical features of design, details of operating convenience, etc., much as they used to when they dealt with the subject of Corliss engines, and recognize and give consideration to better detail design of not only the turbine itself, but its appurtenances.

The progress in the construction of turbines has not been to reduce intrinsic cost. The increased reliability, while sometimes secured by more skillful design, and at even a reduction of cost, generally, however, involves a greater cost. The more difficult operating conditions, higher pressure, superheat and vacuum, each involves greater expense. The higher vacuum calls for larger low-pressure blade arrears, as well as an increased number of turbine elements. The higher pressures and superheat both involve more turbine elements, and also preclude the use of cast iron for the high pressure portions, adding materially to the cost of the units. Competition calling for the highest performance has brought about the employment of higher design coefficients which introduce still another element of increased cost. The increase in rotational speed for a given size machine is about the only item besides improved manufacturing processes that have enabled manufacturing costs to be reduced, and for alternating-current apparatus speeds now have reached their limit for large units.



Cross-Section of Large Westinghouse Turbogenerator Shown in Operation at Opposite Page.

In spite of this, the price (under pre-war conditions) of large turbine generating units has been reduced to approximately 40% of the cost of the earlier large turbines of 5000 kw. or thereabouts. The efficiency ratio has been increased in this size approximately 8%. Considering the larger sizes that now obtain, the cost per kilowatt is further reduced and efficiency ratios have been improved 12%.

The future development of the steam turbine will be along lines of greater reliability, greater safety and increased economy. All these tend to increase the cost of the unit, however.

Pulverized-Coal Tests Conducted at Milwaukee—I.

The Milwaukee Electric Railway and Light Company Installs Equipment at Oneida Steeet Plant—Details of Installation—Efficiency of Over 85 per cent Obtained

During the early part of 1918, the Milwaukee Electric Railway & Light Co., in an effort to determine the advisability of utilizing pulverized fuel in its plants, decided upon a trial installation at the Oneida street station. The necessary equipment for preparing and feeding the coal was installed and the boiler was placed in service during the early part of May. From that time until early in August, when the installation was finally proven successful, changes were made to eliminate undesirable conditions encountered during preliminary operation.

Equipment.

The drying and pulverizing equipment, installed in a room located near the plant coal bunkers, consists of one 15-ton-per-hour indirect-fired dryer, and one 4-ton-per-hour pulverizer. From one of the coal bunkers the fuel as delivered to the plant is carried to the dryer supply bin by means of a screw conveyor and bucket elevator. From this supply bin the coal is drawn into the drying cylinder by means of another screw. It is carried through the dryer by means of gravity and discharged into an elevator which carries the dried fuel to the pulverizer supply bin. In the dryer, the moisture is reduced from 11 to 1% at the rate of about 10 tons per hour.

The coal in passing to the pulverizer supply bin is run over a magnetic separator pulley which removes such iron and steel as has been carried that far. From the bin last mentioned, the fuel is fed to the pulverizer through a small screw conveyor located on the top of the mill. This screw being driven from the mill shaft by means of a small belt, can be varied in speed through a cone-pulley arrangement. This allows for variable feeder speeds, depending upon the kind of material being powdered.

The fuel, after passing through the pulverizer, is carried on by means of a screw conveyor to the pulverized fuel storage bin located in front of the boiler. All drives on the conveying and pulverizing equipment are so arranged that only such machinery as is in use will be operating.

The equipment for firing the fuel into the furnace consists of a blower and two screws, driven by variable-speed motors. The screws located at the base of the powdered-coal bin carry the coal at a uniform rate to the feeder pipes, where it is thoroughly mixed with air by means of agitator wheels attached to the end of the screw shafts. From the paddle wheel, the fuel is carried into the furnace by the air blast supplied from the blower. The furnace is of the Dutch oven type so as to insure the proper flame travel, thus preventing the destruction to the brick work.

Operation.

When first the boiler was put into operation, a number of undesirable conditions resulted. An insufficient air supply caused high furnace temperatures. These temperatures caused fusion of the ash particles and a consequent accumulation of slag between the tubes, on the furnaces walls and in the ash pit. The removal of the molten slag presented a rather difficult proposition. It was also found that the combustion chamber was of insufficient size. High gas velocities resulting from insufficient air tended toward destruction of the refractory surfaces of the furnace.

A new furnace was therefore designed. The combustion chamber was enlarged and a regulated air supply was provided for by means of a number of auxiliary air openings equipped with dampers. The accumulation of slag in the pit was prevented by raising the point of admission of the fuel into the furnace. As a result, the flame path was raised above the base of the pit, hence, particles of ash dropping from the flame are not fused. The ash can, therefore, be drawn from the pit in the form of a powder and small slugs of slag. Analysis has shown that the ash contains practically no carbon.

Tests.

Having established satisfactory furnace-operating conditions, a series of efficiency and capacity tests were conducted preliminary to prove contract guarantees. The brickwork was then given a thorough trial by carrying the boiler at a continuous rating of 180% over a period of several days. On Aug. 12 and 13, a final efficiency test—the results of which will be published next week—was run.

The boiler is an Edge Moor, three-pass water-tube boiler, equipped with a superheater. The coal feeders and burners are of the "Lopulco" type, manufactured by the Locomotive Pulverized Fuel Co., of New York.

Because of the nature of the equipment, the coal could not be weighed on the firing floor. To arrive at exact coal figures, it was necessary to run all drying and pulverizing equipment free of coal. The fuel in the pulverized-storage bin was run to as low a level as possible and a measurement taken to determine the cubical contents of the powdered coal on hand at the start. Coal for the test run was then weighed into the system at the moist coal bunker. At the close of the run, the starting conditions, so far as was possible, were again established. The samples for analyses, upon which the test results are based, were taken at the moist coal bunker as the coal was weighed in. Moisture samples were also taken at the pulverizer feeder and the burners. All analyses were made at the laboratories of the Milwaukee Electric Railway & Light Co. A report of the tests will be given in our next issue.

The installation at the Milwaukee plant is of great interest, as being another instance of a progressive central-station company giving serious consideration to the possibility of using pulverized coal in solving the difficult fuel problem of the times. In the issue of Oct. 5 we described an installation of this type at Seattle, Wash. Other central stations will doubtless follow this new fuel practice.

ARC WELDING SCHOOLS GIVE FREE TRAINING.

The Education and Training Section of the Emergency Fleet Corporation has established a special branch for handling electric welding problems and training. This service is open free to shipbuilders or those aiding shipbuilders or the government, by doing important war work.

The training centers are schools to give intensified practice in the use of metal electrode for elecrtic arc welding. Three schools are in existence, one in Cleveland, O., one in Schenectady, N. Y., and one in Brooklyn. A center also is to be established in Philadelphia. It will be ready for students in two or three weeks. The procedure of entering these schools is very simple, as it is necessary only to inform the electric welding branch as to the number of men that are to be trained and when they are to be sent to any of the training schools. When this information is supplied. all arrangements are made to take care of the men.

A further course of instructors' training will be given any man upon completion of his electric welding training work, so that other companies can have the benefit of the man as a skilled instructor.

The Fleet Corporation will certificate any man who is sent for this specialized training, after he has performed sufficient production work to insure that he is proficient in electric welding.

GIRL EMPLOYES OF CENTRAL-STATION COMPANY PROVE PATRIOTISM.

Electra Club of Commonwealth Edison Company Active in Many Phases of War Work.

The efforts of the central-station companies throughout the country to add to the comforts of the men in service are particularly well shown in the activities of the "Electra," an organization of the women employes of the Commonwealth Edison Co., of Chicago. This company, whose employes in service now number upwards of 1200, has spared no pains to minimize the hardships which these men might be required to undergo. Indeed, its efforts extend beyond its own employes and special attentions have been shown to the soldiers and sailors in camps surrounding Chicago, of whom there are a great number.

In all these activities the Electra has taken a most important part and recognition of its efforts is well expressed in a letter from Mr Insull, president of the company, to the men in service last Christmas. The letter, which accompanied a box containing tobacco, candies and other luxuries, says in part:

"These boxes are sent out large as the result of the efforts of Electra, and we believe they will be none the less welcome because they come with the sympathetic touch of our women's hands."

For several years the Electra has been active in welfare work, especially during the Christmas holidays. At the outbreak of the war the organization immediately plunged into Red Cross work and the grateful acknowledgments of many knitted articles from the men gave proof of these untiring efforts. When the scarcity of knitting material caused the Red Cross to disband many of its organizations, many of Electra's members joined the remaining auxiliaries. Electra then interested itself in the sending of safety razors, smileage books, etc., to the boys. A class was formed to make surgical dressings and the weekly attendance at it proved the ardor of its members.

Last winter, under the able leadership of Mrs. Insull, a series of Saturday night dances was held in Consumers' Hall in the company's building for the recruits from the Great Lakes Naval Training Station and also for soldiers from Camp Grant. Again the attendance, both of the girls and also of the guests, was the best proof of the success of the affairs. The music for these occasions was furnished by the Edison Symphony Orchestra.

Considerable activity has been shown by these girls in the sale of War-Savings certificates and Thrift stamps and of Liberty bonds. One of their more recent enterprises was the sale of tickets for the United States Government War Exposition which was held at Grant Park, Chicago, Sept. 2-15. Teams were formed among the girls to dispose of 10,000 tickets and when the results were tabulated it was shown that over 14,000 tickets had been disposed of.

The efforts of these young ladies are, of course, fostered and encouraged by the company officials, but the cheerful enthusiasm with which they accept these arduous tasks is worthy of special recognition.

BUREAU OF SAFETY DISTRIBUTES TIMELY SLOGAN.

In an effort to combat the present epidemic of influenza, the Bureau of Safety in Chicago has printed and distributed throughout the different departments of the Commonwealth Edison Co. copies of the slogan,

Useful Health-Promoting Placard Being Displayed About the Premises of Several Electric Companies.

a reproduction of which is shown herewith. On account of its originality and attractiveness, this should serve as an incentive for other companies to exert every influence at their disposal in order that the spread of this disease may be stopped as quickly as possible.

MANUFACTURERS FORM AIR CIRCUIT-BREAKER SECTION.

A new section of the Associated Manufacturers of Electrical Supplies has been formed to be known as the Air Circuit-Breaker Section. G. A. Burnham, of the Condit Electrical Manufacturing Co., of Boston, is chairman; H. L. Smith, General Electric Company, Schenectady, N. Y., is secretary, and T. A. McDowell, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., is treasurer.

Editorial Comment

Economy in Burning Natural Gas Under Boilers

BECAUSE natural gas was plentiful it was cheap, and because cheap it was wasted and its use abused. Conditions have changed, however, and it is time to bring about greater economies in the use of natural gas. In many quarters there threatens to be a shortage of natural gas, partly because of the increased demands following increased industrial activity and partly because scarcity of coal has encouraged consumption of gas.

Natural gas for firing of boilers possesses so many advantages over coal that those able to do so use it either alone or in addition to coal. Absence of coal and ash handling and storage space, ease of control and distribution and cleanliness of combustion have combined to make natural gas a fuel *par excellence*, which fact power-plant operators have not failed to recognize. Nevertheless, they have in too many instances failed to appreciate the need for using it economically, and the high efficiencies that should obtain fail to materialize.

There are a number of plants operating with boilers fired by natural gas that show an over-all efficiency of 85 per cent. Unfortunately, there are many more giving results far lower than this, and lower than is justified. Perfect combustion is not difficult to obtain with gas. But perfect combustion and high boiler efficiency are entirely different and independent matters. Therefore, every effort should be made to obtain perfect combustion with this valuable fuel and also attain the highest boiler efficiency by use of proper heat insulation, minimum excess air, tight settings and suitable baffling. These things are so much more easily attained with gas than with coal that there is little excuse for failing to reach the goal of 85 per cent efficiency.

A tall stack is one of the greatest dangers so far as economy in burning natural gas is concerned. When the stack is a tall one the draft is usually so much in excess of that required that considerable excess air is taken into the furnace chamber, a condition usually present with coal and gas firing. Baffling may often be changed to overcome the effect of excessive stack height. One way of doing this is to change from vertical to horizontal baffling, another to change the number of passes. It might be mentioned here that the horizontal baffle seems to find preference over the vertical with gas-fired boilers using gas exclusively, since the objections of the horizontal baffles with coal do not exist when gas is employed.

The velocity of the gases of combustion passing through the passes is an important factor in determining boiler efficiency, since the rate of heat transfer varies with the velocity of the gases through the boiler heating surface, although rate of heat transfer does not increase proportionally, a factor largely controlled by the baffling. With gas as fuel, very much less excess air is required than when using coal, a fact that should be borne in mind when proportioning the passes. Six per cent excess air is ample, an almost impossible condition for coal firing. Both the volume and weight of the products of combustion are less, per unit of capacity, with gas as fuel, than is the case with coal, a fact to be remembered in proportioning the passes.

The two controlling factors of combustion are temperature and mixture. Temperatures are always high when combustion is complete, as it should be before the gases come into contact with the boiler tubes. Mixing, therefore, assumes prime importance in a given furnace chamber, and this in turn comes down very largely to a question of burners. A burner should permit easy control of air and gas, burning back at low rates of combustion and with low gas pressure should be impossible, air should be shut off when gas is shut off, and perfect mixing of gas and air should occur. This at once opens up an interesting field for discussion, but suffice it here to say that the usual practice of furnishing one burner per 30 boiler horsepower might with advantage be changed to one per 15 horsepower.

With a power plant using both coal and gas, or changing over to gas from coal, excessive stack height is probable. For gas burning with ordinary baffle arrangements a stack height of 50 feet is generally ample, which is not the case with coal firing and natural draft. There is particular need, therefore, for modification of the baffling to prevent excessive draft, reduce excess air and increase boiler efficiency in the plant changing over to the use of gas. It is better to change the baffling than use stack damper control because higher efficiency obtains by increasing the path of gas travel and having these gases impinge against the boiler tubes over a longer path.

The average power plant using coal and gas takes the gas as it comes, pays little attention to burning it or controlling the air furnished it. The high combustion efficiencies possible are lacking, and a valuable and convenient fuel is not properly utilized. The time has surely come when natural gas should be used more economically and efficiently, thus enabling to be attained the high economy of labor and fuel that is possible.

The perfect combustion obtainable, absence of handling such as obtains with coal, close control and immediate availability, makes economical gas burning imperative in the interests of coal conservation.

Tendency Toward Increasing Industrial Illumination Intensities

WHILE an illumination of 4 or 5 foot-candles has in the past been considered fairly satisfactory for the average industrial lighting installation, the indications are that a considerably higher standard will obtain in the future. In fact, a move is now being inaugurated in one of the large cities of the United States to endeavor to establish a standard of about 9 or 10 foot-candles for the average machine shop or plant of similar character. A campaign for this increased intensity standard is being waged on an economic basis. It is claimed that by installing lighting equipment which shall produce 9 to 10 foot-candles on the working plane—as against the older standard of 4½ or 5 foot-candles—the increase in output which results amounts to from 8 to 45 per cent. The value of 8 per cent increase was noted in the spring months in a plant working only a day shift. The 45 per cent increase was observed in a shop working a night shift.

The cost of the increased energy required for the additional lighting was so very much less than the value of the increase of production due to it, that this energy cost was inconsequential. Even with the 9 or 10 foot-candle intensity suggested, the lighting cost under average conditions will then be only 0.8 cent per day per man, that is, less than one cent per day per man. Some advocates of this policy of increased intensities maintain that the day is not far distant when an illumination of 14 or 15 foot-candles in the average industrial plant where relatively high-priced operatives are employed will not be unusual. Furthermore, these advocates produce figures which tend to show that the 15 foot-candle intensities will prove to be an economic proposition.

After all, it must be recognized that even with these latter intensities we are still far from the ideal of good industrial lighting, which corresponds to the average illumination obtained around noon of a cloudless day in a shop with sawtooth roof so as to secure north-sky daylight. The illumination intensities obtained with such ideal lighting may be in the neighborhood of 50 to 80 foot-candles with fairly clean glass surfaces in the skylights. By contrast with these values, the intensity of 15 foot-candles referred to above is very modest indeed, yet it can be obtained economically with the highly efficient lamps and reflectors now available, as can also much higher lighting intensities.

However, it must not be forgotten that intensity is not the only requirement of good industrial illumination. Of equal importance are uniformity of light distribution and the avoidance of dense shadows, on the one hand, and of serious glare, on the other. Overemphasis on intensity at the sacrifice of good distribution and freedom from glare would be very unfortunate. All campaigns for increased intensity must also imply improved distribution of the light and improved diffusion at the light source. What is needed, in the words of an old slogan, is more and better light.

War-Time Lighting Economies

CURTAILMENT of lighting as a war measure has been discussed so often within the last year as to have become worn almost threadbare as an issue. And yet there is still so much misinformation and ill-considered advice given on this subject that it is refreshing to find a clear and carefully studied summary of the problem. The first comprehensive and thoughtful survey of lighting curtailment was that presented by Preston S. Millar before the Illuminating Engineering Society last February. At the convention of the Society held in New York City last week the matter was again presented, this time in a masterful report prepared by the Committee on War Service of the Society.

This report was prepared at the request of the Fuel Administration and therefore may be said to be at least semiofficial. Had it been possible to draw up a report of this nature at the time the first lighting curtailment orders were issued, and as an explanatory supplement thereto, nearly all of the misconception of the meaning and proper execution of the various orders would have been avoided. Moreover, there would not have been lost, as has been the case for almost a year, a splendid opportunity to effect a substantial fuel saving and at the same time a very real improvement in lighting by eliminating wasteful, obsolete, bare and glaring lamps and supplanting them with modern, efficient lamps provided with the proper reflector and diffusing accessories.

The report of the committee presented last week is therefore especially welcome. It was prepared after most painstaking investigation and gives the most sane general and detailed advice as yet offered on effective lighting economies so as to secure the greatest possible fuel saving without impairing public welfare or diminishing useful accomplishment. The committee shows that the most successful conservation is elimination of waste of light, not reduction of use of light. It gives valuable technical guidance on how daylight can be used most effectively and how the necessary artificial lighting can be utilized with the least possible waste. Special emphasis is appropriately placed on the use of efficient lamps, appropriate reflectors and shades, frequent cleaning of windows, lamps and lighting accessories, providing light ceilings and walls, judicious replacement of certain lamps, and the avoidance of fallacies in lighting economy that defeat its own ends. Specific suggestions are given as to store, hotel, home, office, school and industrial lighting.

All told, this is the most valuable report on this subject ever issued. Being written in nontechnical language, it is especially suitable for general distribution among the public, which we hope it will receive in order to correct much misinformation and give sensible advice on this subject.

Week's Events

Illuminating Engineers Hold War Convention—Fire and Accident Prevention Discussed by Municipal Electricians

ILLUMINATING ENGINEERING SOCIETY HOLDS WAR CONVENTION.

Twelfth Annual Convention Held in New York as a Strenuous One-Day Meeting to Discuss National Service.

The Illuminating Engineering Society as a body has contributed much during the last year toward winning the war. Its members individually have contributed much and two have made the supreme sacrifice. Its twelfth annual convention, held in New York City on Oct. 10, was therefore fittingly a war meeting. All things discussed hinged in some way upon the idea of national service.

And so it was that President G. H. Stickney, with great seriousness, departed from all things technical and scientific in making his address. The annual business meeting had been dealt with, as also the report of the Council, when Mr. Stickney delivered the few carefully chosen words he had in store.

War, he said, came first. It had been the one fundamental thought back of the activities of the Society during his term in office. Many of the aspirations of the Society, as to economics, efficiency and the higher artistic development of illumination, had been held in abeyance. The chief aim of the officers and members had been to make the Society of the most service to the Government. He did not speak at great length but there was an intensity of purpose embodied in his remarks which did not bode well for certain unspeakable foreign elements with whom our Allies and ourselves are contending.

Report on Progress.

F. E. Cady, chairman of the Committee on Progress, briefly summarized this committee's report. It contains a number of interesting and unlooked for developments. For instance, it has recently been discovered that illuminating gas can be produced from straw refuse. This has been tried in the Canadian Northwest. Special retorts are used. A ton of straw will give 11,000 to 12,000 cu. ft. of gas, besides 6 to 8 gallons of tar and ammoniacal liquor. Scarcity of tungsten for incandescent lamps has brought the wolfranite of China to the front. Much of it comes from districts so remote that the ore is carried on human shoulders for a distance of 60 miles, then 80 miles by junks to the railroad. The extensive use and importance of flashlights is indicated by a single Navy order for 182,000 dry flashlight batteries and 68,000 lights without batteries. An analysis of data from public utilities of the Middle West for the month of April indicated an average reduction in output in kilowatt-hours due to daylight saving of about 5 per cent. And so on throughout the report of 61 pages, there are scores of points of interest and value.

There was nothing much to report on behalf of the United States National Committee of the International Commission on Illumination. Dr. E. P. Hyde, president, explained that, owing to the war, naturally nothing had been or could be done other than to try to keep together and pave the way toward co-operative work when the world powers are again at peace.

Automobile Headlight Problem.

The convention was honored by the presence of F. M. Hugo, Secretary of State of New York. He spoke upon the New York State automobile headlight law. The state has a problem on its hands with 465,000 licensed automobiles, 90,000 miles of highway, 150,000 chauffeurs and 125,000 other licensed drivers. It devolves upon him to make the highways of New York State safe for democracy. The two most vicious things are the intoxicated driver and the glaring headlight. The former is on the way to becoming a purely historical figure on account of the gradual drying up of the source of his demoniacal inspiration. The latter is with us strong, however.

Mr. Hugo said that the authorities are on their way to a fairly satisfactory solution of the headlight problem, a law having been passed, which although not perfect forms a basis for action. He has been working with the Electrical Testing Laboratories with good results. Specifications have been prepared which seem to fit. Now it is a matter of a propaganda of education to the automobile user, to get him to conform to certain standards rather than one of further and more drastic legislation. The specifications referred to have been prepared and tabulated in a booklet which is available to those interested.

Dr. C. H. Sharp, chairman of the Committee on Automobile Headlighting Specifications, followed with remarks concerning some road tests made with separate batteries on the cars, rheostats and photometers, which entirely eliminated guesswork.

The report of the Committee on Lighting Legislation and Statement Concerning Work of the Divisional Lighting Committee was briefly abstracted by Chairman L. B. Marks. The report of the Committee on War Service was delivered by Chairman P. S. Millar. This committee has carried on 13 special pieces of work for the Government agencies, although a report of this part of the work cannot be given at the present time for obvious reasons.

Just before the morning session adjournment, T. C. Martin, charter member of the Society, spoke a few words in behalf of the Fourth Liberty Loan upon which he is actively engaged.

In the afternoon Mr. Stickney called the meeting to order at exactly 2 p. m.; in fact he conducted every session and timed every speaker on a minute schedule, assisted by a system of ingeniously contrived lights to first wink at and then stare out of countenance any overzealous speaker who might become temporarily deaf to the gavel. In fact, most of the speakers became nervous and quit a minute or two ahead of time under the strain.

Cantonment Lighting.

"Lighting of Cantonments" came first—a discussion by Bassett Jones, or rather it didn't come first,

for Mr. Jones did not arrive until 34 seconds after 2 and the president had half finished with one of the other speakers by that time. Mr. Jones, however, told of some of the things he had seen in army camps, such as misconceptions of good lighting arising out of the limited time in which the early camps had been thrown together. For instance, the drop-cord fever, as he called it, resulted in some halls in cords hanging from the ceiling to within a few feet of the tables. The whole room was dark and gloomy, and perhaps later made into a schoolroom. In one place of this sort the average cost was $14 per outlet, $10 of which was for labor. They promptly fired the contractor and put in proper ceiling lights for $5 per outlet. In another case they decreased the wattage one-half and obtained twice the effective light by eliminating drop cords and tin reflectors. In a hospital they found drop cords again, with the lamp about arm's length over the patient's head for him to stare up into. In an operating room they found five 200-watt lamps in a small circle in the ceiling directly over the table. The result was shadows, no matter where the surgeon's hands might be. This was changed, of course. A large circular fixture was made and suspended from the ceiling not far above the operating table. The lamps, with proper reflectors, were arranged on the inner circumference. The result was light from all sides, and consequently no troublesome shadows. They made the fixture themselves, because the manufacturers wanted $175 for such a special fixture and they made it for just $22.

A discussion of "Wartime Lighting Economies" was presented through the efforts of the Committee on War Service. Following this came "Productive Lighting Intensities" by W. A. Durgin, of Chicago. Other features of the afternoon program were: "Protective Lighting," by Edmund Leigh, chief of plant protection, military intelligence; the "Relation Between Light Curtailment and Accidents," by R. E. Simpson, and "Standardization of Metal Reflectors," by Ward Harrison. After this came the formal introduction of George A. Hoadley, the new president of the Society, for the ensuing year.

In the evening, the dinner and program given in the ballroom of the McAlpin Hotel was a most enjoyable occasion. D. McFarlan Moore, chairman of the Convention Committee, presided. There were a few remarks from Retiring-president Stickney and also a word of greeting from President Hoadley.

Coal Conservation and Lighting Agreement.

O. Monnett, of the Bureau of Conservation. United States Fuel Administration, said this was a war of steel and ships, primarily based upon coal. In the Franco-Prussian war there were 650,000 shells fired altogether. In this war, the same number have been fired in 78 minutes.

At Verdun, 60,000,000 shells, equal to 1,800,000 tons of steel, were fired. It takes 800,000 tons of coal to build a ship of 3000 tons. Within the next three months, 21,000,000 tons of steel will be required by war industries. These figures tell something of our requirements.

As to coal production, last year it was 10 per cent greater than the year before. This year, in spite of difficulties it will be 10 per cent above that. And yet we must save and save. To conserve coal, the Fuel Administration is following it and checking it all the way through the power plants to the switchboards and even beyond that, to the very lamp sockets themselves.

Illuminating engineers occupy a very special position in this scheme of things. In the saving which they can help to make there is a psychological effect, a spectacular effect, entirely apart from the actual pounds of coal gained. A blaze of light creates the impression in the public mind that things are going well—no cause to worry. It is necessary right now (during the Liberty Loan campaign) for engineers to help cut down on spectacular displays so that it may appear that the country is in deadly earnest—working for a knockout, as it is.

Scientific and Industrial Research.

Col. R. A. Millikan, of the National Research Council (Professor Millikan of Chicago University), made an address that is hard to describe. It was soldierly, it was also scholarly and thoughtful. He fitted the two together very effectively. First he wanted those present to counteract, wherever they could, the spirit of bragging that is creeping into so many American hearts now that we have entered the war and now that things are going well. He asks us to remember that what we have done up to the present time is so small in comparison to what the English and the French have been doing for four long years and that boasting is abhorrent.

Turning to the scholarly and scientific, he said that up to the present time the position of the United States in research has been that of a second-rate nation. Never have we begun to have the number of high grade, highly trained men that they have in England or in Germany. We do not touch several European nations in our respect and appreciation of science. Even during the war, with so many more men free, we have not begun to make the progress that England and France have made in scientific research. After the war, international competition will be pitiless. It will be something the like of which the world has never known. We must lay a better foundation for industrial success. The war is teaching us and we are going ahead. But there is infinitely more to be done.

The development of research as we will work it out will be better than the German way. It will be by voluntary association in a democratic fashion in a great central body or clearing house of scientific information, aided by several groups or scientific centers more or less closely related to our institutes of learning. But above all there must come to the American people a greater appreciation of science and its relation to our industrial upbuilding.

The evening program was then concluded by the presentation of a four-reel film upon the "Training of the Soldier," by courtesy of the United States Army General Staff.

BALL-BEARING INDUSTRIES RECOGNIZED AS ESSENTIAL.

The Priorities Division of the War Industries Board, in circular No. 19, has placed manufacturers of ball bearings and steel balls on the preference list with a rating of Class B-3, conditioned upon their executing and filing pledges of co-operation with and observance of the rules of the Priorities Division. This finding is based on the fact that ball bearings promote efficiency in the operation of machinery, reduce wear and tear, and improve the reliability of machines on which they are used, thus clearly promoting quite substantial conservation of fuel, metals and labor.

WAR-TIME CONSERVATION DISCUSSED BY MUNICIPAL ELECTRICIANS.

Fire and Accident Prevention Among Many Topics Considered at Atlanta Convention of International Association.

The twenty-third annual or "win the war" convention of the International Association of Municipal Electricians, held at the Piedmont Hotel, Atlanta, Ga., Sept. 24 to 27, developed many important papers and discussions and, as many of the delegates remarked, it was one of the busiest conventions ever held by the association.

The attendance at the convention, while not as great as in former years, was better than had been expected owing to war conditions and was well distributed from all sections of the country, one delegate being present from Canada. Dr. Chas. P. Steinmetz, of Schenectady, N. Y., the eminent electrical engineer who has never missed a convention during the time he has been a member of the association, was not able to attend owing to illness. His absence was greatly regretted.

The character of the papers read and the discussions that followed dwelt to a considerable extent on conditions caused by the war or growing out of it. Fire prevention was one of the important subjects that came in for a good deal of discussion, while the report of the municipal standardization committee represented a very progressive undertaking by the association. Discussion of a paper on "A Code of Electrical Rules Covering Both Fire and Accident Prevention," was regarded by all as a very important and timely matter.

A feature of the election of officers was the re-election of C. E. Diehl, city electrician of Harrisburg, Pa., as president, and that of Clarence R. George, city electrician of Houston, Tex., as secretary; Mr. George is beginning his tenth year as secretary. It was decided to hold the 1919 convention at Chicago, the date to be announced later. An important resolution adopted by the association was one tendering the services of its members to the Federal Government in whatever capacity they can be used in order to help win the war. In inviting conferences with Government officials, the resolution recited the facilities for fire prevention and protection in the hands of the members in the various cities throughout the country, already well organized, that are available for federal organizations concerned in war activities. The resolution also declares that already in some municipalities the facilities of the electrical inspection departments have been placed at the disposal of federal authorities. The fact that federal representatives in some localities have apparently remained uninformed of facilities available prompted the adoption of the resolution, especially where attempts at ineffective duplication of facilities have been made, or the utilization of such facilities has been neglected. The various branches of the Government interested will be notified by the secretary of the action taken by the association. The resolution was offered by J. W. Kelly, Jr., chief of the Electrical Bureau, Camden, N. J.

Among the recommendations made in the annual report of the executive committee were the following: That a committee be formed to be known as the jurisprudence committee; that some plan be developed by which the annual convention exhibits may be made more interesting from an educational viewpoint and that the association provide an exhibit consisting of samples of peculiar or chronic cases of electrical trouble experienced from time to time. Members should supply such samples, accompanied by a brief description of the cause, together with a remedy for the same, and that a place be provided on the program for discussing the same. This would be in addition to the regular exhibits made by manufacturers and others.

There was an interesting line of exhibits, although not as extensive as in former years. The Gamewell Co. showed its latest fire and police signal boxes, together with methods of communicating between police stations and officers on their beats. The Kellogg Switchboard & Supply Co. showed telephone appliances. Other exhibitors were the National Electric Specialty Co., the Square D Co., the Mohrlite Co., and the F. B. Cook Co.

Fire and Accident Prevention.

Summaries of the principal papers presented are given below.

A paper that attracted much attention was that read by Washington Devereux, chief of the Electrical Department of the Philadelphia Fire Underwriters' Association, on "What Can the Municipal Electrician Do to Aid in Fire Prevention." He said we need more education instead of legislation on this subject and declared that grave responsibility rests on the city electricians because fire prevention is one of the most vital questions of the day; it will help in winning the war. Among Mr. Devereux's suggestions were maintenance of city fire-alarm system in the best possible condition, installation of automatic fire-alarm systems at docks and other water-front properties, use of private fire-alarm and competent watchmen's systems by industrial plants, insistence on inspectors using electric flashlights instead of matches, supervision and detailed inspection of all installations of electrical equipment. Mr. Devereux also gave quite a complete review of common causes of fires, such as hot ashes, lighted cigar and cigarette stumps, coal and gas stoves, explosions of benzine, gasoline, gas, dust, etc., chemicals, oil stoves and lanterns, matches, etc.

"Municipal Safety Rulings" was the title of a paper presented by A. MacLachlan, secretary of the Square D Co., Detroit, Mich. He called attention to the heavy toll of accidents in industrial plants annually, which amounts to about 35,000 killed and 2,000,000 seriously injured in spite of the "Safety First" agitation of the last few years. Referring to electrical accidents, he said that the open knife switch was one of the most prolific causes of this class of accidents. This fact is becoming recognized and quite a number of municipalities have prohibited the open knife switch. Many other municipal electricians are in favor of this action also, though they have not yet insisted on it. Mr. MacLachlan read a number of telegrams from various authorities recommending insistence on inclosed switches and pointing out their advantages. The convention also went on record as being opposed to the use of unprotected knife switches and recommended enactment of the necessary legislation to compel the use of approved inclosed knife switches operated from outside of the box.

Dr. M. G. Lloyd, of the Bureau of Standards, Washington, described what was being accomplished in preparing a code of electrical rules covering both fire and accident prevention; a condensed reprint of his important paper appears in another part of this issue. He also said that the Federal Government would render all aid in its power in effecting the installation of safety appliances, especially in plants engaged in war contracts. Safety standards would be

insisted on in such plants. This means new safety rules and the owners of such plants will have to live up to them.

F. A. Cambridge, chief electrician of Winnipeg, Can., gave a short, interesting description of the battle he had waged to prevent the use of unsafe electrical appliances in Winnipeg and the results he had obtained from it. On account of the cheap electric rates in Winnipeg a great demand was created for household heating and cooking appliances, as well as other novelties. The result was that the city soon became flooded with a lot of unapproved and unsafe apparatus. In spite of very active opposition on the part of the merchants, Mr. Cambridge succeeded, in April, 1917, in having a law passed giving the city electrician the power to condemn and order withdrawn from sale any appliance, device or material that in his opinion is likely to be a source of danger. In case any ruling is deemed unjust an appeal can be made to the Public Utility Commission. Since the passage of the law he has considered it necessary to condemn about 24 different lines and types of apparatus. The results have been very satisfactory. The condemning of the products of the irresponsible manufacturers has encouraged the reliable manufacturer to such an extent that nearly all the appliances now offered for sale in Winnipeg are those approved by the underwriters.

James B. Yeakle, superintendent of fire-alarm telegraph of Baltimore, Md., reviewed the history and progress of the fire-alarm telegraph in a very interesting manner. Mr. Yeakle is particularly well fitted to speak on this subject, having been associated with this branch of the industry since the early days of its development.

E. E. Salisbury read a paper on "The Advantages of Police Patrol Signal Systems to Municipalities," in which it was shown that the efficiency of police departments is increased not less than 40 per cent by such systems.

Jacob Grimm, chief of the police signal system of Buffalo, N. Y., in a paper on "Development of Police Signal Systems," gave a historical review of these systems and discussed the distinctive features of the various systems developed and the several improvements brought out from time to time. Mr. Grimm did not look for any very radical developments in police signaling, although further improvements are to be anticipated and great extension of the use of these systems expected.

The report of the standardization committee, R. A. Smith, chairman, presented for criticism standards for municipal electrical departments as follows: Class A, fire-alarm telegraph; Class B, police-signal telegraph. These received considerable discussion, especially as regards specifications for underground cable, which were adopted as standard by the convention for underground use in fire and police-signal systems.

William S. Boyd, secretary of the Western Association of Electrical Inspectors, presented a very interesting and educational paper on "The Importance to the Public of the Inspection of Interior Wiring." Mr. Boyd discussed at some length the early and present attitude toward electrical inspection of the business man, the householder, the electrical contractor, the electrical manufacturer and the central station. The gradual change of these different people from the original resentful attitude to the present high esteem in which the electrical inspector is held by them was very clearly brought out. This very interesting paper will be published substantially in full in a forthcoming issue.

ELECTRICAL EXPORTS FOR JULY MAKE GOOD SHOWING.

Highest Total Value Shown Since Last December—Detailed Figures as Disclosed in Government Report.

An increase of over 40% over the corresponding month a year ago is shown in the electrical export total reported for last July by the monthly summary of the foreign commerce of the United States issued by the Bureau of Foreign and Domestic Commerce, Washington, D. C. As compared with preceding month there was an increase of over 6%. In fact, the July total is the third highest and is only a little over 6% below the record total of last December.

The classified figures for last July and for the corresponding month of 1917 are shown in the following table:

Articles.	July, 1918.	July, 1917.
Batteries	$ 240,640	$ 290,312
Carbons	100,098	102,828
Dynamos and generators	283,407	96,057
Fans	105,823	41,245
Heating and cooking apparatus	64,823	23,295
Insulated wire and cables	477,448	357,953
Interior wiring supplies, including fixtures	135,221	119,994
Lamps—		
Arc	524	1,962
Carbon filament	6,775	23,349
Metal filament	309,919	198,637
Magnetos, spark plugs, etc	151,821	269,941
Meters and measuring instruments	236,019	68,630
Motors	943,006	411,687
Rheostats and controllers	18,730	14,201
Switches and accessories	186,086	177,052
Telegraph apparatus, including wireless	30,710	14,100
Telephones	296,970	180,937
Transformers	287,459	112,022
All other	1,518,470	1,325,164
Total	$5,393,949	$3,829,366

PRELIMINARY WORK FOR PROPOSED HYDROELECTRIC DEVELOPMENT ON SKAGIT RIVER.

In connection with the proposed hydroelectric development on Skagit river by the city of Seattle, it is announced by A. H. Dimock, city engineer, that topographic surveys in the region of the proposed project are completed; that a survey of a 30-mile road from Rockport to the power and dam sites has been made, and that the 100-mile transmission route from there to Seattle is being located. Borings with two drills are being made on both sides of the river at the dam site, and it is proposed to increase facilities by obtaining either a third diamond drill or a churn drill. In order to carry on this work expeditiously, a cableway, with carrier, was established, reaching from one bank of the stream to the opposite bank, for carrying men and supplies.

It is probable that, after all preliminary work has been done, bids will be called for the entire construction and installation, and also for the work in separate units.

DR. WHEELER ADDRESSES NEW YORK ELECTRICAL SOCIETY.

The three hundred and sixty-seventh meeting of the New York Electrical Society was held on Oct. 15 in the Engineering Societies building, New York City. Dr. Schuyler Skaats Wheeler, who recently returned from France and England, gave a very interesting address on "Electrical Work for the War Blind." He described especially the training of blind soldiers in armature winding, which Dr. Wheeler has been trying out with success at the Ampere, N. J., works of the Crocker-Wheeler Co.

LIVES OF NON-EMPLOYES SAVED BY UTILITY MEN.

Employes of Commonwealth Edison Company Do Excellent Work as Result of Training in Resuscitation.

For over five years the safety organization of the Commonwealth Edison Co., Chicago, Ill., has labored effectively to prevent accidents to persons and property. It has not only been successful in this work, so far as the company itself is concerned, but the training received by employes has in several instances been the means of saving the lives of persons not connected with the company. This is especially true of the employes of the street department of the company, whose work takes them out on the street. However, every employe whose duties require him to work on or near "live" wires is instructed weekly in the Schaefer method of resuscitation and is examined periodically for proof of his fitness.

Not long ago the Edison men showed what they could do in a drowning accident. A 10-year-old girl fell into Lake Michigan not far from East 53rd street. A force of linemen connected with the Southern District of the street department of the company happened to be working near at hand. Without hesitation, Paul Murphy, the chauffeur of the linemen's wagon, leaped into the water, reappearing a moment later with the apparently lifeless body of the child. Assistance was promptly extended, and the little girl was quickly brought to the shore. H. C. Breckenridge, foreman of the men, immeditaely applied the prone method of resuscitation, and in a few minutes there were signs of life. The lifeguards of the 51st street beach arrived about this time and they took the patient to a hospital, where, by evening, she was reported as having fully recovered. Mr. Breckenridge was assisted by the other members of his "gang," including Herman Gesswein and Felix West.

In more than one instance Edison employes have made convincing demonstrations of the value of their first-aid knowledge in the case of persons overcome by gas. In one case seven of the men of the Northern District of the street department, under Foreman F. A. Manthey, were instrumental in saving the lives of two employes of the Peoples Gas Light & Coke Co. of Chicago, the latter having been suffocated by gas while working in a manhole at Montrose boulevard and Rockwell street. The Edison linemen were working in the vicinity when they received word that two men were lying unconscious in a manhole nearby. They rushed to the scene, raised the victims to the surface of the street and put in practice at once the Schaefer method of artificial respiration. After about 30 minutes of this work two doctors arrived on the scene and there was a discussion whether the men should be removed to a hospital or the artificial respiration should be continued. In accordance with the rules of the company, Mr. Manthey insisted that his men be allowed to continue with their methods and this course was followed. After about an hour's work the persevering rescuers were rewarded, the patients giving unmistakable signs of life. The two sufferers from the accident, after thus being started on the road to recovery, were removed to a hospital. The Edison men assisting the foreman were Messrs. Knop, Murphy, Bouffard, J. Smith, Gudgeon, Zons and Zuppinger. There are many other similar instances.

Thus the teachings of the safety organization of the Commonwealth Edison Co. have saved the lives of outsiders, while they have also reduced the number of accidents in the Commonwealth Edison organization to a very marked degree. The safety work is carried on through various committees, the most important being a Central Committee on Safety, co-operating with the Bureau of Safety, which does safety work over a wide geographical area. The administrative work of the safety movement is carried out under the direction of an inspector of safety and fire prevention.

The Commonwealth Edison Co. is one of the holders of the gold medal awarded by the American Museum of Safety to American employers conspicuous in the successful execution of methods and plans for the safety of employes.

PHILADELPHIA IRON AND STEEL ENGIGINEERS TO HAVE INTERESTING MEETINGS.

Philadelphia Section of the Association of Iron and Steel Electrical Engineers Announces Schedule for 1918-19.

The Philadelphia section of the Association of Iron and Steel Electrical Engineers announces its meetings and speakers for the season of 1918-19. The program includes several eloquent speakers who are scheduled to talk on some very interesting subjects.

The next meeting will be held Saturday, Nov. 2, when a general discussion of the subject, "The Employment of Female Labor in Electrical Departments of Large Industrial Works," will take place. Dec. 7, G. E. Stoltz of the Westinghouse Electric & Manufacturing Co. will describe "Plate Mill Drives." Jan. 2, "Machine Tool Drives" will be described by H. W. Tige of the Bethlehem Steel Co. Feb. 1, the electrical features of Hog Island will be described by J. H. Anderton and H. W. Osgood, electrical engineers of the American International Shipbuilding Corp. March 1, a joint meeting is arranged with the American Institute of Electrical Engineers. At this meeting Dr. W. S. Franklin of the Massachusetts Institute of Technology will deliver a lecture. April 5, H. B. Vincent, of Day & Zimmerman, Inc., will address the members on "Power Transmission." A general discussion will take place on May 3. The season will close with the annual outing, June 7.

All meetings will be held in the Engineers' Club, 1317 Spruce street, and will start at 8 p. m.

ELECTROLYTIC SALT EXTRACTION.

Extraction of Salt from Sea-Water Initiated in Norway.

A company is about to start the exploitation on a large scale of a method for extracting salt from seawater. The undertaking is being backed up by a number of men of exceptional standing. The process is due to Professor Helland Hansen, and the venture is backed by $5,000,000. It will in all probability be found expedient to erect several works along the coast of Norway as more electric energy becomes available. The comparatively large capital is principally necessary on account of the large plant needed, pumping stations, etc., absorbing the bulk of the power; the production of the salt itself only requires a small amount of energy and is consequently cheap. As to the location of the new factories, no definite decision has been arrived at, but Stavanger has been mentioned as a likely place for the first factory, and the Glaamfjord for the second.

After the War Reconstruction

THE President's second reply to Germany's peace overtures struck a responsive chord in the hearts of all true Americans. Whatever the result of further negotiations may be, the fact becomes more evident every day that the enemy is approaching military and moral collapse and that a victorious peace is in sight.

While continuing to devote our every thought and energy to the business of finishing the war, it is not out of place to give some little consideration to the reconstruction period that must of necessity follow. In the devastated portions of Europe the reconstruction will be actual and immediate. Cities and villages must be literally rebuilt, as well as railways, telephone and telegraph systems and other agencies of civilization.

In this country the reconstruction at first will take the form of a readjustment. In the words of Otto H. Kahn, the prominent New York banker, "the immediate sequence of the ending of the war is bound to be an interval of confusion and of readjustment, during which certain industries will be favorably and others unfavorably affected. But with the completion of this process there should be, for a few years at least, an immensity of opportunity and a corresponding prosperity producing activity such as even this country has rarely experienced, always provided that, while recognizing and respecting the demands of the new day, which is a day of progress and social justice and of searching and testing for the right, we do not venture too far or too fast into uncharted waters."

Relations between employers and employes must be determined on the basis of mutual fair play and enlightened good will; there must be an adjustment of occupations to care for the returning soldiers and at the same time accord adequate recognition of female labor in our industries; there must be a readjustment of tariff schedules to guard against an influx of hoarded goods from present enemy countries; the thousands of plants now busily engaged in the production of munitions of war must be adapted or readapted to their normal or newly developed peaceful pursuits. These are just a few of the hundreds of equally insistent questions that must be considered and on which the future permanent prosperity of this country must depend.

The solution of these problems must rest with a board or commission or other governmental agency vested with the necessary power to formulate and carry out a constructive program of preparedness. Great Britain some time ago created a Ministry of Reconstruction and it is imperative that similar action be taken in this country.

Congress should take up without delay the creation of a body definitely charged with the study of the numerous problems and the drafting of the most practical solutions thereof. Action on this matter is pending in one of the houses of Congress. It should be brought to a head as early as possible in spite of the present political campaign. However, should there be an earlier termination of the war than now seems probable, it would doubtless be most feasible to empower several of the special war-created bodies, such as the War Industries Board, the Food Administration and Fuel Administration, to take up the after-war problems in their respective fields. These bodies are well organized and are doing untold good by regulating on a national basis and in accordance with the entire country's needs the supply of raw materials and the consumption of many finished products. The United States Employment Service is another agency whose powers have been greatly enlarged during the war to the point where they may be advantageously exercised to help solve the distribution of labor.

In approaching the problems of the reconstruction period we should not be carried away by optimistic hopes that they will not be of great importance or will somehow automatically solve themselves. Preparedness for post-war conditions is as important as for war. Nor must we work at cross purposes. We must co-ordinate our efforts as we now are doing, in order that we may achieve the greatest good for the greatest number. This evidently calls for a definite program of action on broad national lines and it is to lay down the groundwork for this that a national reconstruction commission is desirable.

The details of any national program must, however, be worked out by the industries themselves and in this connection the task of the electrical industry is a stupendous one. Every branch of this industry has been vitally affected by the war and the readjustments and preparations necessary for peace and prosperity are of deep concern to every individual and every organization in the business.

It is with a keen appreciation of the responsibilities of the electrical industry in aiding to avoid economic and industrial chaos that the ELECTRICAL REVIEW will undertake to present to the industry a series of constructive thoughts that it is hoped will be of guidance in formulating a workable program, and which will deal with the problems of the manufacturer, the public utility, the contractor-dealer and the employe, alike. The consideration of after-the-war problems, of course, will not detract from the necessity of continuing our war activities on an even greater scale than ever before. As a matter of fact, waging a modern war is reconstruction itself in the sense that it introduces so many urgent problems that perforce bring about new developments in their solution.

in the Electrical Industries—I.

In this department the ELECTRICAL REVIEW *will present at frequent intervals items dealing with the after-war reconstruction activities in the electrical industries. Manufacturers, jobbers, central stations, contractor-dealers and all others interested are urged to contribute full particulars of any activities in this direction so that the industry may benefit from an interchange of such comments.*

MINISTRY OF RECONSTRUCTION SET UP IN ENGLAND.

Doctor Addison Appointed to Position Intended to Shape Post-war Policies.

Following the slogan that "Increased Production Should Pay for the War" the British Government preparations for increased industrial activity after the war are rapidly assuming definite proportions. During the past two or three years many scientific research committees have been appointed whose findings have helped the officials immeasurably in this work. The plans recently culminated in the appointment of Doctor Addison as Minister of Reconstruction early in August. Doctor Addison is especially well fitted for this position, having been at the head of the munitions and supply organizations at the time of his appointment. In this position he has probably had more to do with the reorganization of the British industries and has a better knowledge of the apparent needs of industry and labor for after the war than any other man in England.

In the past, science has never been accorded its proper place in the councils of the nation. The public, and even some of the technical, schools have had classical men at their heads and for instructors. The popular belief held that a classical degree was necessary to scientific knowledge. However, the setting up of the many technical committees, etc., to investigate scientific conditions has given science and scientific management their proper place in the affairs of the nation.

Doctor Addison's post-war problems are and will be many and varied. To return the old factories and industries to their former productions as soon as possible is in itself a man-sized job. However, to keep in operation the new munition plants by rearranging them for peaceful labors will doubtless add considerably to this.

One feature which should be of inestimable help in clearing of the problems is the fact that since the war started great strides have been taken by the British manufacturers in co-operative effort. With the outbreak of the war the German and other enemy interests in British industries were thrown out. This loss, coupled with the extraordinary demands made by war conditions, threw the manufacturers together into co-operative organizations with the result that old individual methods were done away with and their place taken by new and efficient methods. This has resulted not only in increased industrial activity, but also in many cases is expected to put many firms on a firmer financial basis than they were before the war. In connection with this latter condition the formation of the British Trade Bank for affording financial assistance to the industries should be a further help towards the rapid reconstruction desired.

This policy of the British Government may well be studied with profit in this country.

PLANS FOR WATER-POWER DEVELOPMENT AFTER THE WAR.

British Committee Making Study of Hydroelectric Possibilities for After War—Over 50,000,00000 Hp. Available.

The preliminary report of the Water Power Committee of the Conjoint Board of Scientific Societies recently appointed by the British authorities to investigate scientific and industrial problems has just been issued. The development of the water power of the empire as a necessity in order to recover with rapidity from the financial burden imposed by the war is very strongly urged. It is pointed out that of the 120,000,000 hp. now used all over the world, only about 16,000,000 hp. is developed hydraulically. Of this amount only about 1,750,000 hp. is developed in the empire, although the total amount used there is 13,000,000 hp. In the United States the total amount developed hydraulically is over 7,000,000 hp. out of a total used of 29,000,000 hp. The possible water power of the empire is estimated at 50,000,000 hp., much of which is capable of immediate development. It was pointed out that in order to take proper advantage of the natural resources of the country, this abundant supply of cheap energy should be put into use as soon as possible and the formation of a commission consisting of a representative from each Dominion was earnestly recommended to further this idea.

NEW TRANSMISSION LINE AT PORTLAND, ORE.

New Transmission Line Traverses Country Holding Many Possibilities for After-War Development.

The Portland Railway, Light & Power Co. recently completed a transmission line, carrying 11,000 volts, from Portland, Ore., across the Columbia river to Vancouver, Wash. This makes three of its lines which cross that stream and connect substations in the two cities. In extending the third line, about 2600 ft. of it is carried on 4-pile dolphins, anchored along the course of the interstate bridge, to the south limit of the draw-span; and from that point to the Washington shore, a distance of 1300 ft., the line consists of a submarine cable of standard construction.

In Vancouver, the Standifer steel-ship yards, including a new unit being equipped, will have a connected power load on this company's lines of 2650 kw. The Government's spruce cut-up mill requires 1000 kw. and the Standifer wooden-ship works about 600 kw.

This is an excellent example of the foresightedness of the power companies in the Pacific states in tieing together water-power and steam-power stations and systems in order to meet the present war conditions and prepare for post-war demands.

Operating

Breechings Insulation—Noiseless Explosive—Oil Saving—Outdoor Transformers—Soft Coal Storage - Lighting Table

HEAT-INSULATING LININGS FOR BREECHINGS.

Discussion of Internal and External Breeching Coverings.

By N. A. Hayward.

Boiler breechings are often insulated with heat-insulating materials to conserve heat and improve draft when natural draft is used. This heat-insulating material may be applied to the inside, to the outside, or to both inside and outside of the breeching.

In the choice of whether to insulate the outside or the inside of a breeching, several matters that appear to be ignored in many installations should be given consideration. Covering the exterior of the breeching is simpler than covering the interior of the breeching, because the insulating material is more easily applied and more easily maintained with lower rate of deterioration when on the exterior. However, in the opinion of the writer, insulating material should be laid round the exterior of a breeching only when the interior is likewise covered.

There are a number of reasons for advocating this. Covering a breeching with heat-insulating material is to keep the heat inside the breeching, primarily, although another reason, more often the case where mechanical draft is used, is that the use of heat-resisting material on the interior of a breeching lengthens the life of the breeching. If the heat is kept in a breeching by installing the heat-insulating material on the exterior of the metallic breeching then overheating of the breeching may occur, obviously, since the temperature of the breeching will approximate the temperature of the gases passing through it. The exterior covering keeps the heat in and results in the breeching attaining higher temperatures than it otherwise would. A breeching internally lined is kept cooler than it would be otherwise, and without in any way affecting the heat loss or loss in draft due temperature drop.

Steel breechings have become so overheated, as the direct result of lining them externally with heat-insulating covering, that they have failed and collapsed. In other cases the heat held by the steel breeching has attained such temperature as to cause what is known as secondary combustion in the breeching, another condition directly chargeable to the external heat-insulating covering. Careless supervision, the shutting of a damper, closing of an ash-pit door on a hot fire, and similar favorable circumstances will turn almost any boiler setting into a gas producer. An intensely hot breeching because of heat held in by an external covering then constitutes a hazard in that a fire or an explosion may follow.

For the above reasons the writer does not in the ordinary way favor the application of external heat-insulating breeching coverings, except when the breeching is also lined internally. Both internal and external coverings add to the heat saved and increase the life of the breeching. In employing internal breeching linings it should be borne in mind that the material chosen should not contain elements which, under operating conditions, may cause corrosion of the steel under the influence of heat, moisture or furnace gases. Moreover, it is well to bear in mind the fact that temperature changes and high temperatures, attrition and vibration, and chemical action, make it well to give internal linings close periodic inspection for deterioration.

QUICKLIME FOR REMOVING FOUNDATIONS.

Interesting Application of Slaked Lime Where Use of Explosives Was Impossible.

By G. Nelson.

Removing foundations of power plants is often a very expensive and protracted proceeding on account of the strength of the masonry of which the foundations are composed, the difficulties under which the work must be prosecuted, and due to the presence of machinery, cramped working space, etc.

In many cases these massive masonry foundations can be removed by drilling and the generous use of wedge and sledge. However, it sometimes happens that it is preferable to use explosives for sectionalizing a large foundation, thereby reducing the amount of labor and time involved. On the other hand, the use of explosives is not free of danger even in the hands of the expert when they are called upon to break up materials in very close proximity to operating machinery. With great care as to proportioning the amount of powder to the work, judiciously choosing the location of the borings and taking special care that debris will not be scattered about, blasting powder in the hands of one familiar with its possibilities and dangers has much to recommend it, and only then.

There is a method of breaking up massive foundations of masonry and stone work, etc., that possesses all the advantages of dynamite or blasting powder, but with all the disadvantages lacking. It is a method that is somewhat slower but none the less sure. It consists of using slaked lime, or quicklime, as it is sometimes called, and water. Quicklime has sometimes been called the noiseless explosive because of its ability to exert enormous pressure, comparatively slowly and noiselessly, and without scattering debris broadcast.

There are many instances where it is most convenient to be able to split up massive structures without interfering with objects in close proximity to them, for example, in buildings and where operating machines are located nearby the structure to be split or shattered. In these cases the use of slaked lime is superior to explosives. The preparative work for lime is much the same as for powder. Holes should be drilled in which the lime is to be tamped. These holes for heavy work should be about 3-in. diameter. The lime is then inserted, after which water is put in and the whole rapidly covered with earth or some other covering.

To make the matter clearer. Suppose it is desired

to break up a brick masonry foundation that had been used for supporting an engine, and that the dimensions of this foundation approximate 12 ft. by 12 ft. by 12 ft. This mass could be broken at the ground line and hauled away solid or in a few pieces if desired; on the other hand, it could be split up into a number of units, probably the more convenient method. For the former the writer would have drilled at the ground line eight 5-ft. holes, 3-in. diameter, three holes on two sides of the foundation and one on each of the other two sides. For the second method of breaking up the masonry, namely, into small units, probably the least amount of drilling would be to drill nine holes 3-in. diameter, vertically downward, thus removing the first 3 ft., and repeating the procedure.

As to filling the holes with slaked lime. Lime in lumps about ½ to 2-in. in thickness should be used. These are poked into the hole for a depth of about 1 ft., then a void of about 3 in. is left, and then another foot of lime poked in, and so on until within about 6 in. of the top of the hole. Water is then poured in so as to seep through the loosely packed lime, and the top of the hole well tamped down with earth of similar filling. In a few minutes, varying from about 5 to 10, the masonry will crack. It might be well to give a warning against being too slow in charging the hole, because unless the earth filling is tamped in rapidly after the charge of water, lime and filler may be blown out of the hole to the injury of the worker.

RULES FOR CONSERVING FUEL OIL.

Suggestions by Fuel Administration for Saving Oil.

Suggestions for handling and burning fuel oil were made public recently through the issuance of the following letter of instructions by the Bureau of Oil Conservation of the Oil Division of the United States Fuel Administration to all users of fuel oil:

"The Administration wishes to impress upon you the importance of taking immediate steps to prevent avoidable waste. It is necessary to conserve fuel. It is your duty to have your furnaces, boilers and other fuel oil equipment inspected and any waste stopped. The instructive suggestions read:

(a) "When unloading tank cars, use great precaution to prevent the loss of oil when uncoupling the discharge pipe or hose.

(b) "Stop all leaks in oil pipe lines, fittings, valves, and storage tanks, and see that all tank openings are kept closed. Storage tanks should be equipped with steam-heating coils.

(c) "Install efficient burners. Home-made burners are usually crude and consume an excess of oil.

(d) "Install strainers. Dirty oil clogs the burner, slows up heating operations and increases fuel consumption.

(e) "Install duplicate pumping systems, and pump the oil to the burners under a uniform and constant pressure.

(f) "Install suitable preheaters, in order to obtain proper atomization, clean combustion, and prevent the formation of carbon. This is especially necessary with the heavier gravity oils.

(g) "Use pyrometers in all heating and heat-treating furnaces. The operator may have good eyesight, but he cannot always judge heat by color. If there is a higher temperature than necessary, fuel is being wasted.

(h) "Impress upon furnace operators the necessity of conserving fuel by keeping their furnaces and equipment in the best condition possible, in order to obtain the maximum of economical efficiency.

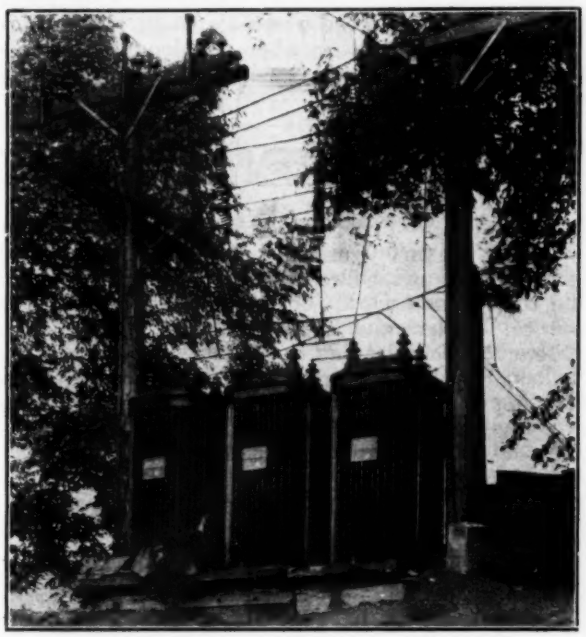
(i) "Install oil meters, thus enabling you to keep a record of daily consumption and compare it with previous data and note the decrease in the amount used.

(j) "Have sufficient oil storage capacity, otherwise you may have to shut down because your oil shipments are delayed and supply exhausted. Shut-downs mean a loss of heat and added fuel consumption.

(k) "Operate furnaces twenty-four hours a day when possible."

MAKE-SHIFT CHOKE COILS FOR TRANSFORMER PROTECTION.

The accompanying illustration shows a bank of 200-kw., single-phase transformers of the outdoor type used for stepping down the voltage from 6600 to 460. The secondary or 460-volt load consists of an electrically operated drag line used by the Miami Conservancy Board, in the Miami River Valley, Ohio.



Installation of Outdoor Transformers and Choke Coils.

Both 6600 and 460 volts are protected by lightning arresters, and both sides of the transformers are protected by choke coils built up on the job. The choke coil per phase on the 6600-volt side is mounted above the double crossarms and supported between the two insulators, one on each crossarm per phase. This coil consists of about 20 turns of wire, 4-in. diameter. The choke coils in the low-voltage leads consist of about 23 turns of the conductor, made roughly into the form of a helix hanging in the vertical. Both 6600 and 460-volt coils were made easily and cheaply on the job, yet have so far apparently answered their purpose.

VENTILATION OF TELEPHONE BOOTHS.

Improvement by Piping Air.

By Frank Sutton.

Telephone booths are very largely employed in power plants and substations because of the noise and vibration. These and allied causes tend to make it difficult to hear the operation of the telephone receiver. As a telephone booth is made somewhat soundproof, that is its purpose, it follows that there is also little ventilation. One of the most unpleasant things connected with the use of these soundproof booths is the fact that the air becomes extremely hot and vitiated if a person is closeted in one for any length of time, the condition approaching that of a Turkish bath.

The writer has found it a good policy, wherever conditions permit, to run a small pipe, about 1-in. dia. from the air duct to the booth, to enter the latter at

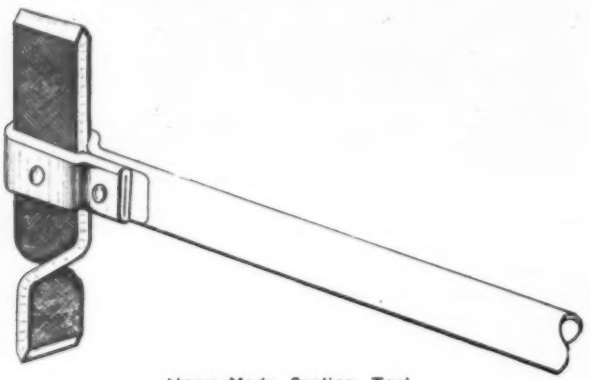
the floor level and drill a similar hole in the top of the booth. This practice results in a steady current of air passing through the booth, preventing the perspiration and discomfort otherwise accompanying a lengthy stay in the booth, such as is often necessary on long-distance lines, and for giving and taking important orders where directions have to be repeated.

In one instance where oil-cooled transformers were used instead of those cooled with air, the writer piped the air compressor supply used for cleaning so that it could furnish air to the telephone booth. The compressor motor started up when the door of the telephone booth was closed by means of a door-type switch.

HOME-MADE SCALING TOOL.

By C. H. Willey.

There are many uses for a scaling tool around power plants and boiler rooms and on maintenance and construction work, for scaling the rust and scale off coal bunkers and hoppers, removing paint from structural steel, cleaning boiler shells, and removing clinkers from boiler settings, etc. Often the work is done in a hurry by a number of laborers, necessitating as many scaling tools.



Home-Made Scaling Tool

Work of this kind is, for the average power plant, of a temporary nature—that is, it is done sporadically, hence a serious investment in tools for this class of work is hardly justified. When such work arises, tools can be made very easily and quickly by the blacksmith in the following way: Old flat files can be used, the file being heated to a red heat, a hole drifted through, and then placed in a vise and given a turn of 180°. The handle for holding the scraper can be readily made out of pipe flattened at one end, bent around the file or scraper, drilled and riveted to the pile. The accompanying illustration shows the tool completed. The pipe handle gives the needed weight to tool proper, so that heavy blows need not be used to cut scale.

STORAGE OF SOFT COAL.

Fire Hazards to Be Carefully Watched.

Large quantities of soft coal are being stored by mercantile establishments, industries and central stations because of the fear of a fuel shortage during the winter. The danger of spontaneous combustion in this causes a serious fire hazard, and unusual care should be exercised by the owners of such properties. The hazard can be reduced by proper selection of the grades and sizes of soft coal, and the exercise of proper precautions in its handling and storage.

Where large quantities of soft coal are stored in the open it should be in separate piles, so that a fire starting will not spread through the entire supply, and the affected pile can be extinguished or moved. Where the coal is stored in basements the Fuel Administration suggests the following precautions:

1. Coal the size of a walnut or larger is well adapted for storing. Mine run, slack or screenings, on account of fine coal and dust, are not suited for storage in a basement.
2. Never place coal near a hot pipe, against a hot furnace or any other hot surface.
3. Do not mix ashes with the coal, as there may be live coals in the ashes.
4. If coal must be wet down, wet only the portion that is to be used immediately.
5. It is very important that pieces of waste, oily rags, sticks, paper and other rubbish should not be mixed, or allowed to come in contact with the coal.

Street Lighting Schedules for November.

Every plant operating street lighting circuits must have a definite schedule for lighting and extinguishing the lamps. Below are given the two most commonly used schedules as compiled for next month. The table is compiled for latitude 40° North. The table gives the time in mean, local or solar time.

In accordance with the "daylight saving" law, all clocks are to be put back one hour at 2 a. m., Oct. 27. However, action is pending in Congress to make the daylight saving continue throughout the winter. If this is passed, the clocks will not be put back on Oct. 27, and therefore all the values given in the table below will have to be advanced one hour.

NOVEMBER, 1918.

Night of Nov.	All-Night Schedule.		Moonlight Schedule.	
	Light.	Extinguish.	Light.	Extinguish.
1	**5:30**	6:00	**5:30**	5:30
2	**5:30**	6:00	**5:30**	5:30
3	**5:25**	6:00	**5:25**	5:30
4	**5:25**	6:05	**5:25**	5:35
5	**5:25**	6:05	**5:25**	5:35
6	**5:25**	6:05	**5:25**	5:35
7	**5:20**	6:05	**6:30**	5:35
8	**5:20**	6:05	**7:25**	5:35
9	**5:20**	6:10	**8:30**	5:40
10	**5:20**	6:10	**9:30**	5:40
11	**5:20**	6:10	**10:40**	5:40
12	**5:15**	6:10	**11:15**	5:40
13	**5:15**	6:15	12:55	5:45
14	**5:15**	6:15	2:10	5:45
15	**5:15**	6:15	3:25	5:45
16	**5:15**	6:15	No light	
17	**5:15**	6:20	No light	
18	**5:10**	6:20	No light	
19	**5:10**	6:20	**5:10**	**6:50**
20	**5:10**	6:20	**5:10**	**7:50**
21	**5:10**	6:20	**5:10**	**9:00**
22	**5:10**	6:25	**5:10**	**10:05**
23	**5:10**	6:25	**5:10**	**11:10**
24	**5:10**	6:25	**5:10**	12:10
25	**5:10**	6:25	**5:10**	1:10
26	**5:10**	6:30	**5:10**	2:05
27	**5:05**	6:30	**5:05**	3:05
28	**5:05**	6:30	**5:05**	4:00
29	**5:05**	6:30	**5:05**	5:00
30	**5:05**	6:30	**5:05**	6:00

Tables for each month of the year, rules for the two schedules given above and for modifications of them, corrections for standard time and latitude, monthly and yearly total hours of burning for the five most common schedules, as well as other information pertinent to the subject are printed in a booklet obtainable from the Electrical Review for 25 cents a copy.

Contracting-Construction

New Code to Cover Both Fire and Accident Prevention—Eliminating Unreliable Contractors—Range Connection

ELECTRICAL CODE COVERING BOTH FIRE AND ACCIDENT PREVENTION.

Bureau of Standards Drafting a Code of Rules for Municipal Inspectors, Combining National Electrical Code and National Electrical Safety Code.

What may turn out to be a very important development for the electrical industry is now being worked on by the Bureau of Standards, Washington, D. C. It consists in a tentative but carefully thought out effort to combine the National Electrical Code, the well established and generally accepted regulations for electric wiring sponsored by the National Board of Fire Underwriters, and the National Electrical Safety Code, which includes the regulations to minimize electrical accident and life hazards drafted by the Bureau of Standards. This effort to combine the two codes has been under way actively only within the last few months and the work so far accomplished has shown that it is feasible and that the difficulties in the way are probably not insurmountable.

The object to be attained by the combination of the two codes and the work done so far were well set forth in a paper presented by Dr. M. G. Lloyd, electrical engineer of the Bureau of Standards, before the convention of the International Association of Municipal Electricians, held a few weeks ago at Atlanta, Ga. The title of the paper was "A Code of Electrical Rules for Municipal Inspectors Covering Both Fire and Accident Prevention." In the first part of the paper Dr. Lloyd reviewed the growth of the National Electrical Code, which was an outcome of the need by fire-insurance interests to adopt uniform regulations for electrical construction in order to keep down the then heavy fire losses from electrical causes. This code first made its appearance in 1897, since which time it has been revised every two years. With the exception of certain rules introduced in recent years, it has remained primarily a fire-prevention code.

About five years ago the Bureau of Standards made some investigations of electrical accident hazards during which the desirability of regulations minimizing these hazards became apparent. The outcome was that the Bureau undertook after much further investigation and research, the drafting of such regulations, which in their present form were issued in November, 1916, as the National Electrical Safety Code. This code consists of four parts, of which Part III was published in full in the ELECTRICAL REVIEW of March 16 to April 20, 1918, inclusive.

The development of this safety code and its application was reviewed by Dr. Lloyd in the second part of his Atlanta paper, in the last part of which he touched on the special need for accident prevention and the movement to combine the two codes referred to. This part of his paper is so important that, instead of abstracting it, we deem it best to reproduce it below, substantially as he presented it.

In the application and enforcement of an additional code of rules by electrical inspectors or others who already have a municipal code or the underwriter's code to apply, some difficulty at once arises, said Dr. Lloyd, and there is likely to be confusion in attempting to apply two independent sets of rules and there is possibility of conflicts between them. This possibility already exists, even in a single set of rules, since different parts of the same set of rules may be found to be inconsistent. The likelihood is far greater, however, when the two sets of rules emanate from different sources and have been drawn up from different standpoints and with different purposes in mind. If rules are duplicated, there may be misunderstanding in making references to the rules. Where the purpose of two sets of rules are so nearly the same as the prevention of accident and the prevention of fire from electrical causes, there is likelihood of duplication in the two sets of rules, and inspectors and those who must comply with the rules are consequently burdened with the consideration of an unnecessary number of rules.

A SINGLE COMBINED CODE.

The above considerations naturally lead to the idea of formulating a single code which achieves the separate purposes of fire prevention and accident prevention at one and the same time. This will comprise a code which expresses all the requirements of the two previous independent sets of rules. In combining two sets of rules for such a purpose some rearrangement may be necessary, some alteration may be made in rules which conflict, and requirements whose simultaneous application would not be feasible. Rewording is likely also to be frequently necessary in regrouping the rules and arranging them in a logical and systematic order.

The Bureau of Standards has not only seen the need for a combined electrical code of this description, but has had this matter presented to it upon the part of a number of municipal officers. The Bureau has consequently undertaken the formulation of a set of electrical rules which should combine the provisions of the National Electrical Safety Code and the National Electrical (Fire Underwriters') Code, so far as these cover the field of electrical generating and utilization equipment, that is, electrical wiring, apparatus and machinery which is used inside of buildings. Part 3 of the Safety Code has been combined with the interior wiring and utilization rules of the Underwriters' Code, to form a new set of utilization rules, and the requirements of the Underwriters' Code which apply to generating equipment have been added to Part 1 of the Safety Code to constitute a new set of rules for application to generating stations and substations, whether these be private isolated plants or the central stations of utility companies.

In carrying out this plan it has not been found desirable to follow the outline and arrangement of either one of the former codes. A new arrangement and grouping of the material has been carried out. The arrangement of Part 3 of the Safety Code was not satisfactory, because of the large amount of material

in the Underwriters' Code which has to do with the wiring of buildings, and this subject receives little consideration in the Safety Code. On the other hand, the arrangement of the Underwriters' Code was not considered suitable for adoption, as a regrouping of its provisions and a more logical arrangement seemed desirable.

The result of this work is a set of rules which at first sight bears little resemblance to either the Safety Code or the Underwriters' Code, but which upon closer examination reveals the old friends with whom the inspector has been familiar in the past. After but a cursory glance at this new Code it will be found easy to locate the requirements for any particular situation and it is intended to make this even more easy by the addition of a copious index. It is thought, consequently, that the new set of rules will be easy of reference and, hence, easy of application, and will serve the purpose of the municipal inspection department far better than two separate sets of rules could do and be far more adequate than either set alone.

In combining the two sets of rules very few real conflicts were met, but in a number of places it was found that permissive alternatives or exceptions in one set of rules are prevented by some provision in the other set. For example, the Underwriters' Code permits a service switch which allows one outside wire of a three-wire circuit to be opened without opening the other side. The Safety Code at present does not permit this arrangement, but requires a service switch to open both outside wires simultaneously. The purpose of the above provision in the Underwriters' Code is to avoid interruption to one side of a three-wire circuit while re-fusing the other side or making some alteration or connection in it. It has been practiced to some extent by electric light companies as, for instance, in Baltimore, but experience in that city does not indicate any great advantage or value for this arrangement of service switch and consequently the cancellation of such permission in the rules as applying to further installations will not work any hardship.

Another example of conflict in the permissible alternatives of the two codes is with respect to the use of insulating joints in lighting fixtures. While the requirements of the two codes are different with respect to this item, it is nevertheless possible to comply with the requirements of both. The Underwriters' Code requires the use of insulating joints on metal ceilings, or ceilings or walls containing metal lathing and combination fixtures or straight electric fixtures, unless the wires have rubber insulation at least 3/64 in. in thickness. It permits the omission of the insulating joint when such insulation is used and the fixture and the gas pipe (in combination fixtures) are properly grounded.

The National Electrical Safety Code requires that fixtures be permanently grounded when within 8 ft. from a conducting floor, such as a metal, concrete or damp floor, or when within 8 ft. from the floor and also within horizontal range of other conducting surfaces, such as radiators, plumbing fixtures, stoves or piping of any kind.

It is evident then that to comply with both sets of rules it is necessary for fixtures in the locations just mentioned to be grounded and to be wired with wires of rubber insulation not less than 3/64 in. in thickness.

The fixture manufacturers object to this requirement because it precludes the use of some of the small tubing which has been used in certain designs of fixtures, but it looks at the present time as if this hobby of the fixture manufacturers would have to be eventually discarded. With the availability of the wall switch, and the chain-pull socket (with insulating link in the chain), there is no necessity for having fixtures within 8 ft. of the floor and consequently within reach of persons except in the case of the wall bracket, and such wall brackets may easily be designed to accommodate wires which will give adequate and safe insulation.

A tentative draft of this combined code is now ready and the Bureau of Standards has furnished copies of it to the Standardization Committee of the International Association of Municipal Electricians for inspection and criticism. An expression of opinion is desired as to the need for such a code and as to the merits of the one which has been worked out. If it has defects, the Bureau wants to correct them and perfect it as far as possible. That, of course, is a detail to be worked out. The question of importance is as to desirability of such a code from the standpoint of the municipal officials, and whether it represents a code that municipalities generally will care to adopt and to apply in their local jurisdictions. When a need for something of this kind arises, the Bureau of Standards is always ready to do what it can to supply the need and its aim is to provide something that will be of greatest service to the citizens of this country. It is only by the co-operation of municipal representatives, however, that the best results can be obtained in work of this kind and consequently it is hoped to have frank criticism of any who may be personally interested in this subject.

ELIMINATING THE UNRELIABLE CONTRACTOR.

Necessary Steps Should Be Taken Now to Wipe Out the Wildcat and Curbstone Firms.

By J. D. Bernard.

For several years, before the war, during the period when building operations were at their height, the electrical contracting field was overrun with what have been properly termed "curbstone" or "wildcat" contractors. These self-styled contractors usually are found in the larger cities but also have been frequently found in the smaller communities, where they thrive for a time, at least. They have no responsibilities, carrying their office and standing stock around in a tool-bag, but nevertheless, the damage which they can do to the established and reliable contractor is very great.

The greatest trouble caused by these men is, of course, in the quality of the work that they do. They use the cheapest kind of material obtainable, not caring whether or not its use is approved by the underwriters. Their work is done in a slipshod and flimsy manner, any method of construction being used, as long as it will carry the load long enough to enable them to collect their fee. Joints are not properly soldered or insulated, the fittings, fixtures, etc., are not substantially installed, and the beams, joists and supporting timbers are cut and hacked until in many cases the building itself is seriously weakened. Then, when trouble develops, the "wildcat" cannot be located, having moved his "office" elsewhere.

This condition may not at first seem to act to the disadvantage of the established contractor who sets a high standard of quality on his work and endeavors to live up to it. Indeed, by comparison it is of real benefit to him. Comparison, however, is not always

possible and to the average person electricity is still a vague and unknown subject. The impression which is created in the minds of these people, who have had their homes or places of business wired by one of these unreliable contractors and which is conveyed by them to others, is anything but desirable.

Fortunately, the war has forced many of these men out of business but the renewal of building operations after the war is bound to bring them into the field again. Therefore, now is the time to provide against them. This can be done in many ways. Many of the larger cities have succeeded very well in eliminating them by registering all contractors and giving them a license. This plan, however, is neither possible nor advisable in many cases. For example, it could not be applied except where the wiring will be inspected or approval received by some other means from the license board before it is connected. Again, in the smaller cities, the contractor relies on getting much of his work from the surrounding towns. This would mean that town licenses would be quite an expensive item to him. Of course, state licenses would do away with this latter to some extent but the operation of a license system entails a lot of red tape and consequent expense.

A better plan and one that should react to the benefit of the trade, is for the local or state organizations to take up the fight against these fellows. With this end in view, the different contracting organizations should make a renewed effort now to enroll as many of the reliable contracting firms in their membership as possible. When this has been done, a little publicity of the right sort will nearly complete the job. By means of newspaper or window advertising the public can be informed, through the organization, that certain firms of unquestionable reliability are its members and of the advantages to be obtained by having wiring done by them. In addition, the members should prominently display their membership cards and use every opportunity to instill into the minds of the public the fact that membership in these organizations is a guarantee that work will be properly done.

This plan might also be broadened to include guaranteed apparatus and appliances also. However, the extent to which it can be applied will depend upon the local conditions and the organization itself. A persistent effort along these lines, however, is certain to wipe out these unreliable contractors. In addition, it will serve to give the individual members the right kind of advertising and thereby increase the value of the organization to the members. This latter feature will, in time, bring nearly all the reliable firms into the membership and react to benefit the organization.

CONNECTING ELECTRIC RANGES.

By John D. Boyd.

Solderless or clamp connectors of approved type have been used to a considerable extent for connecting the feed wires to electric ranges, because in the spaces available it is often difficult to make up and solder splices. They have the further advantage that they can be easily disconnected if it is desired to replace the range. Where soldered joints are used, if a range is replaced, it is necessary to cut the splice with pliers and free end that is left is often not of sufficient length to provide for the making of a new splice. Reconnection therefore requires much more time and is not so likely to make as good a job as the use of a good solderless connector approved for the required capacity.

A SIMPLE METHOD OF PREPARING TRACINGS.

By W. F. Perry.

On account of the increasing cost of tracing cloth and the liability of mistakes in tracing, it is desirable, wherever practical, to transform original drawings directly into tracings. In cases where only a very few prints are required, the writer has found the following method very satisfactory.

The drawing is made on very thin bond paper with the regular waterproof drawing ink. When the ink was well dried the drawings were turned face downward and the backs evenly rubbed with olive oil until the lines showed clearly through the paper. They were then hung up for a few days in order that they might dry out. At the end of this time the surplus oil had disappeared, leaving a dry and greaseless surface, which is not always the case when paraffine or other oils are used.

This method would not be practical where a large number of drawings and prints were to be made, but where a few are required at various times, I hardly think it can be excelled.

IMPORTANT CONTRACT WORK IN PACIFIC NORTHWEST.

The C. H. E. Williams Co., doing an electrical contracting business at Seattle, Wash., and Vancouver, B. C., is engaged on the electrical work on the ten 9400-ton steel ships being built at Seattle by the Seattle North Pacific Shipbuilding Co. The work comprises the wiring and installation of a General Electric 10-kw., direct-current generating unit on each ship, the generator being direct-connected to an oil engine. Another contract in hand is the job of wiring the Seattle Port Commission warehouse, 100 by 600 ft. The Pacific States Electric Co. supplied the material for both jobs. This concern also has the contract for wiring and motor installations for the new wireless-equipment works of Kilbourne & Clark, Seattle, for which 50 to 60 motors are required. In like manner the electric wiring is being done on the buildings of the United States Naval Training Station at the University of Washington, where 500 men are in training.

RADIO INSTRUCTION AT THE DUNWOODY INSTITUTE.

The William Hood Dunwoody Industrial Institute, at Minneapolis, Minn., a school with an endowment of $5,500,000 "for training in industrial and mechanical arts," is now training a large number of men under contract with the Government for both the Army and Navy. One of the interesting departments in connection with this training is the Radio Department, in which at the present time there are over 200 Navy radio students and 50 Army radio students. The men enlisted in the Navy or inducted into the Army or Navy are sent to the Institute for eight or ten weeks for a course of instruction in both operating and theory. The Institute is now considering a material increase in the quota of radio students under training for the Government and needs additional instructors both for class theory and laboratory as well as operating. Any men having proper qualifications, if interested, should write to the Dunwoody Institute for further particulars.

New Appliances

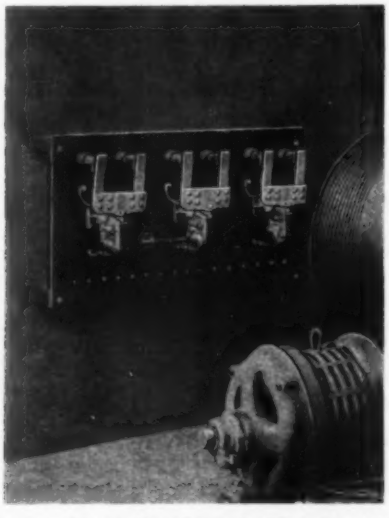
Elevator Control Panel for Squirrel-Cage Motors—Raymo Fixtures—Long Life of Soot Blowers—Crane Developments

SQUIRREL-CAGE ELEVATOR-MOTOR CONTROL.

An elevator control to be used with squirrel-cage motors in sizes up to and including 20 hp. at car-speeds not exceeding 150 ft. per minute has been built by the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., for both freight and passenger service.

The equipment of this elevator control, known as type E, is extremely simple; it consists of a small control panel mounted on the wall somewhere near the motor, a car switch by means of which the operator controls the movement of the elevator cars, and such elevator safety devices as may be desired.

A line contactor and two mechanically interlocked directional contactors are mounted on a slate base. The motor, being started with full line voltage, requires no secondary or accelerating contactors. The car switch closes the line contactor and one of the directional contactors, and thus starts the car in the desired direction.



Car-Switch Alternating-Current Elevator Control.

The equipment is simple in construction and quiet in operation. All parts are easily accessible for inspection or repairs. The contacts are graphite to graphite of the butt type (no sliding contacts are used) and are interchangeable for the various contactors. The same contacts may be used for alternating-current and direct-current type E controllers for both car-switch and push-button operation.

Westinghouse type E brake magnets are recommended for use with this equipment. When the operator, by means of the car switch, closes the circuit through the contactors, a shunt circuit energizes the brake magnet and releases the brake. If the car switch is returned to the "off" position, or if any of the safety devices operate, the control circuit is opened, the brake magnet is de-energized, and the brakes are immediately applied.

The safety devices most commonly used are the emergency switch to be used by the operator in case of accident to the car switch; machine-limit and hatchway-limit switches, which operate automatically to prevent accidents from overtravel should the operator for any reason fail to release the car switch; and door interlocks, which prevent the starting of the car until the door is properly closed.

The car-switch elevator control (type E) is used with alternating-current squirrel-cage motors of 20 hp., with a maximum of 220, 440 or 550 volts. It is of the 25 and 60-cycle, two and three-phase type.

RAYMO ADJUSTABLE FIXTURES FOR STORE AND OFFICE LIGHTING.

To obtain efficiency in either store or office lighting requires abandonment of small and obsolete lamps and fixtures and their replacement by efficient equipment designed for effective and glare-free lighting. A new line of such equipment has been placed on the market by the Moran & Hastings Manufacturing Co., 16 West Washington street, Chicago. It is known as the Raymo line of adjustable fixtures and includes a number of special features.

The unit consists of only few parts, the holder, the upper shade or reflector, and the bowl or diffuser. As shown in Fig. 1, the holder includes a fixture loop, heat deflector, shade-holder or fitter, socket surrounded by husk, and secured to the latter are three bowl-supporting arms and studs; all parts of the holder are assembled together, the three upper parts being finished in Roman gold and the inner or lower parts in white enamel. The shade and bowl are made of a good quality of heavy opal glass and are easily affixed to the fitter and studs at the ends of the supporting arms. The fixture is obtainable either as the holder

Fig. 1.—Holder for Raymo Fixture.

alone, Fig. 1, or with canopy, chain, shade and bowl complete, as shown in Fig. 2.

Among noteworthy features is the fact that the socket is adjustable vertically in the holder, thus adapting the unit for change in the character of light distribution and possibly also for slight change in lamp size. The cleaning of the fixture and lamp is very easily done, as the bowl can be quickly swung down by loosening one of the studs, thus opening the

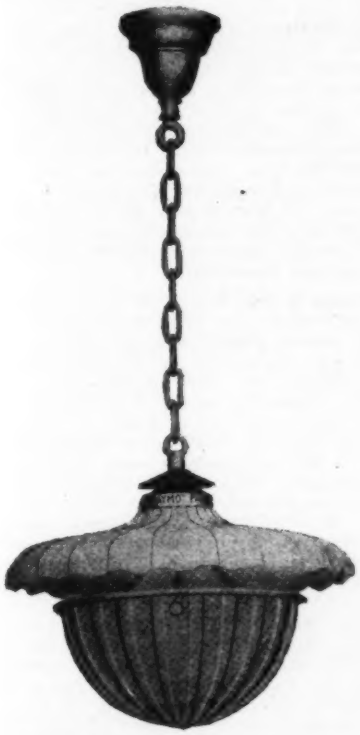


Fig. 2.—Raymo Fixture Complete.

interior for wiping off dust or removing a burned out lamp. Perfect ventilation is provided for. The entire fixture is of simple but pleasing outline. It is made in three sizes, designed respectively for use with 100, 200 and 300-watt Mazda C lamps. The shade sizes used are 13 and 17 in. and the bowls are 10 and 12 in.

These fixtures are being used in a number of notable installations. In the Philadelphia office building of the Emergency Fleet Corporation, 1700 of the Raymo fixtures were installed after a severe test in competition with 9 other rival fixtures. The Raymo units, while themselves very efficient in distributing the light uniformly on the working plane, allow a small part of it to reach the ceiling, from which it is again reflected downward in useful directions while at the same time making the room more cheerful.

LONG LIFE OF VULCAN SOOT BLOWERS DEMONSTRATED.

Five years ago Vulcan soot blowers were installed on 32 B. & W. boilers in the plant of the United Electric Light & Power Co., New York City, totalling 20,000 h. p. These boilers are now carrying 300 per cent of their rated capacity at peak load and are using a total of 2688 nozzles. During these five years only 36 nozzles were bought and placed in stock for emergency use. Very few of the nozzles have been used to date, which may be considered a very good record indeed. The reason for relating this here is to show that seven years as the life of a cleaner is a conservative assumption. The elements in the plant of the United Electric Light & Power Company mentioned are uncovered, untreated, unprotected, absolutely bare to the high temperatures. As now made, the cleaners have a still higher safety factor than those installed five years ago because of the cast-iron sheathed elements with which they are now equipped.

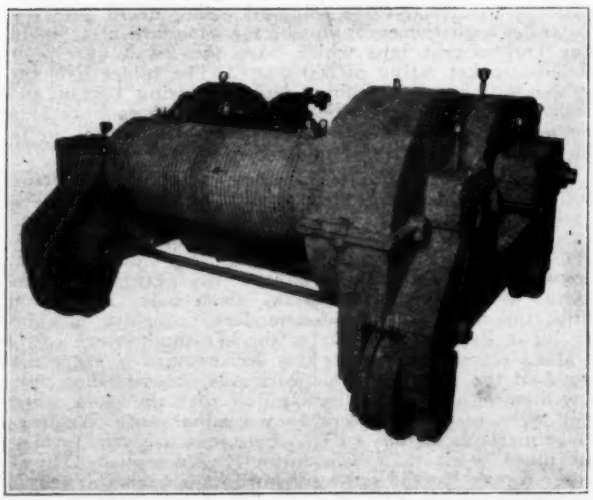
NEW FEATURES INTRODUCED IN ELECTRIC CRANES.

The Ederer Engineering Co., Seattle, Wash., has introduced some excellent features in the manufacture of overhead electric traveling cranes, which make for safety and smoothness of operation under heavy loads and continuous service. These cranes are built for capacities of 5 to 40 tons, 14 of which have been built and installed this year in the numerous shipyards, shops and plants of Puget Sound cities.

A special feature is the mechanical brake, multiple-disk type, which constitutes a departure from the troublesome ratchet control on differential holding band brakes. The brake is mechanically positive, and generates a minimum of heat under full-load working conditions, and is incorporated together with the gears in an oil-tight gear case in one side frame of the trolley to insure alinement of mechanism under all conditions.

Steel-cut gears are used throughout, all of them being inclosed in oil-tight cases. The electrical equipment is especially noteworthy as to completeness of details. All the wiring, the motors and control equipments are inclosed in dustproof cases, easily accessible at all times. All movements are under control of the crane operator from the cab.

The hoist is equipped with a limit switch which can bet set for any vertical lift within the limit of



Trolley for Ederer 10-Ton Electric Traveling Crane.

travel of the lower block, and when this point is reached it operates the limit stop direct; and for lowering it is only necessary to reverse the controller. The electrical equipment is for either direct or alternating-current service. The accompanying illustration shows the Ederer trolley for a 10-ton electric crane.

Trade Activities

Westinghouse Marine Equipment for Destroyers—Milliken Brothers Manufacturing Organized—Special Literature

Angola Electric Manufacturing Co., Angola, Ind., has taken over the Sevison Electric Co., Elkhart, Ind., and the Sevison Electric Repair Co. The new company manufactures the Sevison high tension magneto, an all metal switch which is used with the magneto and three designs of magneto couplings. L. E. Sevison is in charge of the engineering department.

Benjamin Electric Manufacturing Co., Chicago, Ill., is sending out additional information sheets and a new price list for insertion in the Benjamin marine lighting and signaling apparatus catalog, which was recently issued. These sheets illustrate and describe the plunger key or keyless receptacle, switches, junction boxes, outlet boxes, wall fixtures and fittings, push buttons, etc.

Hamilton-Beach Manufacturing Co., Racine, Wis., is sending out to the trade a circular, showing two advertisements of the company appearing in the October and November numbers of Ladies' Home Journal and Pictorial Review, which will doubtless be of great benefit to the dealer of H-B products. These very attractive advertisements feature the Hamilton-Beach home motor and illustrate in a very striking manner its many uses in the home. The Hamilton-Beach company also offers to dealers a number of selling helps, including home motor circulars and booklets entitled "Housework and Health," which will be furnished with imprints if desired.

Cutler-Hammer Manufacturing Co., Milwaukee, Wis., is distributing a new two-color envelope folder entitled "C-H Standard Attaching Devices." Special emphasis is given to the fact that the C-H Standard attaching cap fits all C-H Standard plugs and receptacles as well as the standard plugs and receptacles of five other leading manufacturers. The folder illustrates 21 of the various attaching devices manufactured by this company. They include numerous types of flush, surface, conduit fitting, and metal mounting receptacles, besides motor attachment plugs, cord connectors and current taps. These devices have the National Electrical Code standard rating of 10 amperes, 250 volts, with the exception of the Standard attachment plug and current taps which have the maximum screw shell or socket rating of 660 watts. The folder lists the complete line of attaching devices, giving carton and standard package quantities, and price of each catalog number. The usual space is provided on the first page of the folder for dealers' or jobbers' imprint.

Westinghouse Marine Equipment for Destroyers.—Eight complete vessel equipments of ship propelling machinery, consisting of steam turbines and floating frame reduction gears with auxiliary apparatus were delivered in September to the Submarine Boat Corporation at Newark, N. J. This record is especially gratifying to the marine world as more turbines mean more ships, and ships equipped with the most modern propelling machinery. The Essington Works of the Westinghouse Electric & Manufacturing Co. made this delivery and is especially proud of the record, as the work was accomplished with new men who were neither familiar with the work when they were hired, nor were they familiar with Westinghouse methods at that time. Fewer men are now turning out more work than was formerly accomplished by a larger force. To the same shipyard have been shipped 21 condensers, 8 air separating tanks, 5 circulating pumps and 14 complete sets of propeller shaftings. Shipments of similar apparatus were also made from the Essington Works to the Merchant Shipbuilding Co. at Bristol, and to one of the United States Navy Yards where the Westinghouse marine system is being installed on U. S. destroyers. All told, the report for the month of September, which has just been tabulated, shows the largest volume of shipments for any similar period. In spite of the fact that the effects of Spanish influenza are now somewhat interfering with keeping up production, the works expect to establish a new high record for shipments during October.

St. Paul Electric Co., St. Paul, Minn., jobber of electrical supplies, is sending to its customers a "Good Will" book. This is a handsome booklet of 48 pages, which gives a complete account of its organization, stock, its facilities for giving service and reproduction of letters from its suppliers, which include some of the largest and most prominent manufacturers in the industry. The St. Paul Electric Co. was established in 1899, and has witnessed a steady and rapid growth to its present size and position as one of the largest electrical jobbers in the Northwest, serving the electrical and telephone trade in western Wisconsin, Minnesota, North and South Dakota, northern Iowa and Montana.

E. C. Atkins & Co., Inc., with main offices and works at Indianapolis, Ind., and branch offices in the principal cities of the United States, has for many years been engaged in the manufacture of the well-known Atkins silver steel saws, which have been designed to meet a wide range of uses. This line of saws is one of the most efficient on the market today and the adoption of "Silver Steel" saws by the Government in the following instance is perhaps the highest endorsement that could be given the Atkins product. In order to meet the great demand for skilled labor, the Government has organized a vocational army, of which carpentry forms one of the most important branches. A course of instruction covering a period of about eight weeks is given during which time men are taught through this intensive training to build as well as repair quickly and efficiently, such important things as gun carriage spokes, airplane parts and many other articles made of wood which require mitering and splicing. They receive such wonderful instruction in the two months that they are excellent carpenters after the course of study which, of course, is of a very practical nature. To make them as efficient as possible, particular attention has been given to the tools used with the result that only those tools which have proven their worth have been selected for use in these training institutions, and among those selected were the Atkins "Silver Steel" saws.

Milliken Brothers Manufacturing Co., Inc., New York City, has been organized to succeed Milliken Brothers (Incorporated), established 1857, to specialize in the manufacture and construction of galvanized steel transmission towers. The new organization takes over certain assets, including patent rights, good will, etc., of the former company. C. T. Clack, for many years connected with the United States Steel Corp., and lately secretary of the old company, has become president; J. E. Jennings, vice-president and secretary, for 20 years past has been connected with the former Milliken Brothers (Incorporated), and in charge of the steel power transmission department since its inception; Robert Grant, iron and steel merchant, New York, is treasurer of the company. Transmission towers for high tension power systems have been a feature of the extensive business of the former organization and the new company is planning to enhance this department of operation. Over 40,000 Milliken towers, covering about 4000 miles of transmission or more than would be required to reach from the Atlantic to the Pacific Coast, have been constructed in all parts of the country for such large utility interests as the Great Western Power Co., Southern Power Co., Great Falls Power Co., Yadkin River Power Co., New York Edison Co., Central Colorado Power Co., and many others. Towers for the Big Creek transmission line of the Pacific Light & Power Corp., Los Angeles, Cal. (recently merged with the Southern California Edison Co.) were furnished by the company. The new organization will also manufacture galvanized steel wireless towers, special poles for interurban electric railway systems and city service, as well as the Standardized Truss Unit System, a patented system of all-steel building construction designed by Mr. Jennings. General offices will be located in the Woolworth building, New York.

Current News

Weekly Record of Construction Activities—Conventions

EASTERN STATES.

FAIR HAVEN, MASS.—Considerable new electrical equipment will be required in connection with the construction of a new local naval station base by the Government, Navy Department. Plans for the work are now being prepared.

MELVILLE, R. I.—The United States Government, Bureau of Yards and Docks, has awarded a contract to the C. S. Cunningham & Sons Construction Co., Boston, Mass., for the erection of a new radio building at the local Government station.

FISHERS ISLAND, N. Y.—Considerable new electric equipment will be required by the Government, War Department, in connection with the construction of additional barracks at the local Government station, estimated to cost about $400,000.

GOVERNORS ISLAND, N. Y.—Considerable new electrical equipment will be required by the Government, Quartermaster Corps, in connection with the construction of the new one-story barracks at the local Government station, estimated to cost $160,000, contract for which has recently been awarded the Foundation Co., 233 Broadway, New York.

LA SALLE, N. Y.—Suburban Power Co., which recently filed notice of a change in its corporate name to the La Salle Electric Corp., has awarded a contract to Fred Brooks, La Salle, for the construction of a new transformer house, about 25x35 feet, estimated to cost $10,000.

NEW YORK, N. Y.—An involuntary petition in bankruptcy has been filed against the Bright Star Battery Co., Inc., 310 Hudson street, with liabilities of $50,000 and nominal assets placed at $50,000. Judge Hough has appointed Marcus Helfand receiver.

NEW YORK, N. Y.—Considerable new electrical equipment, refrigerating apparatus, etc., will be required in connection with the large eight-story reinforced-concrete refrigerating plant to be erected by Armour & Co. on the block bounded by Tenth avenue, Marginal street, and Fifteenth and Sixteenth streets.

NEW YORK, N. Y.—The United States Government, War Department, Washington, D. C., has awarded a contract to the White Fireproof Construction Co., 286 Fifth avenue, New York, for the construction of five new local eletcric generator buildings.

PELHAM, N. Y.—The United States Government, Navy Department, has recently completed plans for the construction of a new addition to the brick power plant at the local naval training station. Charles Ewing, 101 Park avenue, New York, is architect.

SYRACUSE, N. Y.—In connection with its negotiations with the Syracuse Lighting Co. to lower its present rates for supplying electric energy for street-lighting, lighting of public buildings, etc., the city council is considering plans for the installation of individual power plants in the various public buildings. It is said that a municipally-owned and operated electric light plant is under consideration.

SYRACUSE, N. Y.—Crouse-Hinds Co., manufacturer of electrical specialties, etc., has broken ground for the construction of a new one-story transformer building at its plant, about 20x40 feet. Dawson Brothers, Union building, Syracuse, are the contractors.

BAYONNE, N. J.—Electrical concerns in the Bayonne section are giving hearty support to the Fourth Liberty Loan; the Electric Dynamic Co. has subscribed to date a total of $18,200; the Safety Insulated Wire & Cable Co., $31,780; and the Babcock & Wilcox Co., $264,950.

BLOOMFIELD, N. J.—Sprague Electric Works of the General Electric Co. has had plans prepared for the construction of a two-story pattern shop on Lawrence street, about 60x160 feet in size. The structure is estimated to cost $17,000.

CAMDEN, N. J.—In connection with the south yard plant of the New York Shipbuilding Corporation now in course of construction, comprising machine shop, angle shop, plate shop, rigger works, storage houses, and auxiliary structures, plans have been prepared for the construction of a new power house and boiler plant for operation. The entire project is estimated to cost in the neighborhood of $10,000,000. The Hugh Nawn Construction Co., Philadelphia, Pa., is the building contractor.

CAPE MAY, N. J.—The Navy Department is having plans prepared for two buildings for marines, a machine and electric shop and a pattern shop at League Island Navy Yard, and for a commandant's quarters and a timber wharf at Cape May.

CAPE MAY, N. J.—The United States Government, Bureau of Yards and Docks, has awarded a contract to the Bates Company, 2 Rector street, New York, for the installation of the proposed new electric fire alarm system (Specification 3422) at the Wissahickon Barracks, at $5,677.

JERSEY CITY, N. J.—General Storage Battery & Repair Co. has filed notice of authorization to operate a plant at 1696 Boulevard. Fred A. Hoefeld, 62 Bartholdi avenue, and Edgar M. Barrett, 1703 Boulevard, head the company.

MANTOLOKING, N. J.—The United States Government, Navy Department, has awarded a contract to the Eastern Construction Co., 110 West Fortieth street, New York, for the erection of additions to the local Government radio station.

NEWARK, N. J.—International Oxygen Company, 796 Frelinghuysen avenue, has had plans prepared for alterations and improvements in its boiler plant.

TRENTON, N. J.—Pending a new hearing to be held on Oct. 23 on the reasonableness of the proposed increased rates for power by the Monmouth Lighting Co., the Board of Public Utility Commissioners has ordered the suspension of the new schedule.

ALTOONA, PA.—Work will begin soon on extensive additions to the great Pennsylvania railroad shops here. The company will spend $2,000,000 for central power plant. Four power plants are already in operation here. Two 5000-kw. generators will be installed in the South Altoona plant, sufficient to supply all the power required, even in great emergency. Address A. C. Shand, chief engineer, Broad Street station, Philadelphia, Pa.

CATASAUQUA, PA.—Clear Springs Water Co. is making rapid progress in the changing of the motive power at its pumping station in the Spring Mill district to electricity. One of the large pumps has already been connected up, power being furnished by the Lehigh Navigation Electric Co.

HOLTWOOD, PA.—Susquehanna Transmission Co. has filed notice with the Public Service Commission of a bond issue for $32,000, to be used, it is understood, for extensions and improvements.

JOHNSTOWN, PA.—Citizens Light, Heat & Power Co. of Pennsylvania has filed notice with the Public Service Commission of a bond issue for $700,000, the proceeds to be used, it is understood, for extensions, improvements, etc.

LEWISTOWN, PA.—Susquehanna Silk Co. has completed the foundation work for the construction of a one-story brick power house at its plant, about 50x100 feet, for works operation.

MILTON, PA.—Milton Manufacturing Co. has awarded a contract for the erection of a one-story power house, about 80x100 feet, estimated to cost $100,000. Sauers & Moore, 86 Broadway, Milton, are the contractors.

NOXEN, PA.—Armour & Co. are having plans prepared for the construction of a one-story brick and concrete boiler plant, to cost approximately $50,000, to be used in connection with the new tannery to be erected at a cost of about $1,000,000. Westinghouse-Church-Kerr & Co., 37 Wall street, New York, are architects for the company.

PHILADELPHIA, PA.—Superior Thread & Yarn Co., Howard and Norris streets, has awarded a contract to the William Steele & Sons Co., 1600

Arch street, for the erection of the proposed one-story boiler plant addition at its works. The structure is estimated to cost $4,000.

PHILADELPHIA, PA.—In connection with extensive improvements to be made at the plant of the Hero Manufacturing Co., Gaul and Adams streets, to provide for increased capacity, plans have been prepared for the erection of a new boiler plant, about 30x30 feet, the entire work being estimated to cost in the neighborhood of $150,000. The company is engaging on important work for the Ordnance Department.

PITTSBURGH, PA. — Duquesne Light Company has filed with the Public Service Commission notice of the issuance of bonds for $15,000,000 and three-year 6 per cent gold notes for $10,000,000. It is understood that the proceeds will be used for the proposed extensions, etc. It is reported that the Government has authorized the company to proceed with the construction of a large new power plant, to have a capacity of not less than 120,000 k.w., and estimated to cost in excess of $10,000,000. The exact location of the plant has not been announced, but it is understood that a site is under consideration in the vicinity of Cheswick.

PITTSBURGH, PA. — A $15,000,000 power plant for the Pittsburgh War Industries Districts will be erected immediately in the Allegheny Valley. The Duquesne Light Co. will be financially assisted in the project by the United States Government. Work on the new plant will commence at once.

BALTIMORE, MD.—United Railways & Electric Co., Continental building, has awarded a contract to the Singer-Pentz Co., Baltimore, for the erection of a new one-story service station at Carroll and Monroe streets.

BALTIMORE, MD.—Baltimore County Water & Electric Co., 100-02 West Fayette street, has issued $150,000 in notes to provide for improvements to plant and to refund indebtedness.

CUMBERLAND, MD.—Edison Electric Illuminating Co. has had plans prepared for extensions in its electric system through Ridgedale to Cumberland.

WASHINGTON, D. C. — The War Department has awarded a contract to Frank L. Wagner, 1413 H street N. W., for the erection of an electric power plant and laundry building at Camp Meigs, Md., near Washington.

HAMPTON ROADS, VA. — United States Government, Bureau of Yards and Docks, has had plans prepared for the installation of a new electric distributing system at the local naval station to cost about $50,000.

NORFOLK, VA. — Virginia Railway & Power Co. is considering plans for the installation of two new boiler units in its power plant to increase the present capacity.

PORTSMOUTH, VA.—The Government plans the expenditure of $10,000,000 to acquire, improve and operate public utilities systems in Norfolk-Portsmouth section: War Industries Board authorized $1,800,000 loan to city to improve and enlarge Portsmouth Berkley & Suffolk Water Co.'s plant; $2,000,000 for highway between Army and Navy bases and cantonments in Hampton Roads District; $1,000,000 for electric power and gas war-time facilities, to include high-tension power connections between Richmond, Petersburg, Suffolk, Portsmouth and Norfolk, addition to power plants and ultimate connection with hydroelectric development on Roanoke River upon which the Government will expend several million dollars; $1,100,000 loan to traction companies for street railway improvements in Portsmouth and Norfolk.

DATES AHEAD.

Jovian Order. Annual convention, Dallas, Texas, October 24-25-26. Mercury, Ell C. Bennett, 1415 Syndicate Trust building, St. Louis, Mo.

American Society of Mechanical Engineers. Annual meeting, New York City, December 3-6. Secretary, Calvin W. Rice, 29 W. 39th street, New York, N. Y.

Western Association of Electrical Inspectors. Annual meeting, Chicago, Ill., January 28-30, 1919. Secretary, W. S. Boyd, 175 West Jackson boulevard, Chicago, Ill.

FAIRMONT, W. VA. — The War Department, Washington, D. C., will build a phosphorous plant. Considerable electrical machinery will be installed and electricity will be secured from the Rivesville power station now under construction by the Monongahela Valley Traction Co.

BELHAVEN, N. C. — The city has had plans prepared for the construction of a new municipal electric-lighting plant. The structure is estimated to cost $25,000.

ATLANTA, GA. — Simplex Farm Light & Pump Co., recently incorporated, will install electric-lighting, power and pump systems in its isolated plant.

NORTH CENTRAL STATES.

VALPARAISO, IND.—After obtaining a loan of $33,000 from the Government, the Valparaiso & Northern Interurban Ry. has entered into a contract to spend the entire amount for new passenger and freight cars to operate between Valparaiso and Gary, the cars to be of steel construction and to accommodate sixty-five persons. The railway company must pay 5 per cent interest on the loan during the period of the war and later, if it desires, can buy them at cost, less depreciation.

HILLSBORO, ILL. — The Illinois Public Utilities Commission has granted an increase in fares to the Southern Illinois Light & Power Co., effective between Hillsboro and Taylor Springs. Tickets will be sold at 6 cents and cash fares will be 8 cents. The line affected is used largely to transport coal miners between Hillsboro and Taylor Springs.

LINCOLN, ILL. — Mayor Herman Reetz of Lincoln, and H. K. Rhoads, superintendent of construction of the municipal street railway company, have returned from Chicago where they made extensive purchases of rails, ties, trolley wire and poles. Work will begin within three weeks on the rebuilding of the Eighth and Union street tracks of the Municipal railway and the building of a 1950-ft. extension to the north mine.

SPRINGFIELD, ILL. — The operation of a new schedule of prices for electric current proposed by the Abbott Electric Service Co. at Petersburg, has been suspended until March 30, 1919. The order affects the towns of Petersburg, Mason City, Tallula and Ashland.

BARRON, WIS.—The city will build power plant by day labor at an estimated cost of $20,000. Engineer J. C. Jacobson, 1135 National-Soo Line building, Minneapolis, has prepared plans.

MILWAUKEE, WIS. — Wisconsin Gun Co. will erect power plant. H. J. Wiegand, general manager, 35th avenue and Orchard street. $180,000 will be expended.

NEW MUNICH, MINN. — The Council is considering the purchase of electric equipment. Address City Clerk.

YORKTOWN, IOWA.—The council has granted franchise to a private company to install electric light system.

KENNETT, MO.—O. B. Gwyn, superintendent of the Gideon-Anderson Lumber Co., will erect a 12-ton ice plant, build bottling works and construct an electric light plant.

DORRANCE, KANS.—Election will be held Oct. 28 to vote $10,000 for the purpose of purchasing works for an electric light plant. E. G. Rankin, clerk.

FREDONIA, KANS.—The factory of the Empire Electric Manufacturing Co., makers of electric lighting plants for farms, was destroyed by fire recently. The loss is estimated at $75,000, most of which is covered by insurance.

LEBO, KANS.—Lebo Light & Power Co. was destroyed by fire recently. The plant furnished power for the elevator and the city's lighting system. Arrangements have been made to have a line run from Emporia to furnish the town with electricity.

PERU, KANS.—A contract will be let in the near future for improvements to waterworks and electrical systems. Archer & Stevens, Kansas City engineers, will complete plans for the work about Oct. 19. Bonds have been voted.

SCRANTON, KANS.—The question of issuing $12,000 electric light bonds has been submitted to vote. D. G. Pyley, city clerk.

CLARKSON, NEB. — $26,000 in bonds have been voted to install power plant. The specifications include engines, boilers, switchboard and deep well pump. Address O. A. Clarke, city electrician.

OMAHA, NEB.—Plans are being prepared for improving plant of Nebraska Power Co. H. E. Babcock, president.

SOUTH CENTRAL STATES.

WHITESBURG, KY. — Elkhorn-Jellico Coal Co. will install an electric power plant.

NASHVILLE, TENN. — Nashville Bridge Co. is in market for an electric crane.

DE QUEEN, ARK.—Commonwealth Public Service Co., Muskogee, Okla., purchased the ice and electric light plants and plans to make improvements.

GENTRY, ARK. — Gentry electric light plant was destroyed by fire with the loss of approximately $5000.

HAVANA, ARK. — Havana merchants have signed a contract with Kile

& Co. to install an electric light plant to furnish both lights and power.

HAZEN, ARK.—J. D. Cash has been granted a franchise to operate an electric plant at Hazen.

NASHVILLE, ARK. — Nashville recently voted $100,000 bonds for waterworks system.

MONROE, LA.—Walter G. Kirkpatrick, engineer, Jackson, Miss., has been employed to prepare plans for a filtration plant at an estimated cost of $25,000. This city plans to issue $100,000 for waterworks improvements.

DUNCAN, OKLA.—George I. Gilbert has purchased $50,000 water works bonds and $15,000 power bonds.

HARTSHORNE, OKLA. — The mayor has been authorized to issue a proclamation calling an election to vote on the proposition of granting to the Choctaw Power & Light Co., a franchise for the right to construct, maintain and operate an electric plant and distribution system.

MENO, OKLA.—Public Service Co. has municipal franchise to construct and operate an electric light and power system and furnish 150 electric lamps.

STILLWATER, OKLA. — The city has awarded a contract for the installation of new equipment in the municipal electric plant, including a new 250-kv.a., 2300-volt, 3-phase cycle generator, exciter, switchboard, boiler, heater, transformers, etc.

TULSA, OKLA.—Instructions were issued to the office of the city auditor to advertise for sale the recently approved water and sewer extension bonds of $575,000.

EASTLAND, TEX. — Eastland Light & Power Co., recently incorporated with a capital of $250,000, has acquired the local electric light plant, and is planning for the installation of new equipment and the construction of new transmission lines to increase the present capacity.

EL PASO, TEX.—Dudley & Orr are having plans prepared for the reconstruction of their power plant in the Mt. Frank district, recently destroyed by fire with loss estimated at $10,000.

GRANBURY, TEX.—R. Grundy will rebuild light, power, ice and water plants reported burned at a loss of $20,000.

RANGER, TEX. — Engineers, who are reported to be representing the Stone & Webster Engineering Corp. of Boston, Mass., are employed in making a preliminary survey for a proposed interurban electric railway system, to connect a number of towns in the oil producing region of western Texas. It is proposed that the main line shall run between Strawn and Cisco by way of Ranger and Eastland, a distance of 35 miles, and that a branch road shall be built to Breckenridge, about 25 miles. It is not expected that the construction of the system will be started until after the war.

WESTERN STATES.

BURBANK, WASH.—F. J. Pingry, manager of Burbank Irrigation Project, is to confer with the Secretary of the Interior relative to the building of a hydroelectric power plant at Five-Mile Rapids, on Snake river, to pump water for irrigating land and to supply electric light and power for domestic and commercial purposes.

COULEE CITY, WASH.—The local electric light plant was entirely destroyed by fire recently.

SEATTLE, WASH. — Seattle is to have an improved cable service to Port Angeles, the War Department having ordered the installation of an additional wire between this place and Port Angeles and installation of a new cable between Port Angeles and Victoria, B. C., under the straits of Juan de Fuca, cost about $120,000.

SEATTLE, WASH. — Skinner & Eddy Corp., 1201 Railroad avenue south, will erect a $20,000 addition to its power plant.

PORTLAND, ORE. — For the protection of its water rights on Hood River and in preparation for development after the war, the Pacific Power & Light Co. has purchased a number of power sites between Wynans, about 25 miles south of Hood River, and the mouth of the river. Surveys, it is reported, have been made for a pipe line from a dam site near Wynans to Ruthton. Rights-of-way have also been secured.

CANADA.

CHATHAM, ONT. — Extensions to the local hydroelectric plant to meet the increasing demands for electrical service are under consideration. Address J. G. Jackson, local manager.

FERGUS, ONT.—The town council contemplates the purchase of a new transformer to replace the one recently destroyed.

VANCOUVER, B. C. — The Tudhope Electric Metals Co. is building an electric foundry. The construction contract for a building, 50 by 100 ft., has been let to the Cotton Company, Ltd.

ROSSLAND, B. C.—Lorne A. Campbell, president of the West Kootenay Power & Light Co., has awarded a contract for 300,000 pounds of copper cable for the construction of a transmission line from Grand Forks to Princeton. This and other expenditures contemplated amount to $300,000.

PROPOSALS

LIGHTING FIXTURES.—Bids will be received at the supervising architect's office, Treasury Department, Washington, D. C., until October 30, for furnishing and installing lighting fixtures in the United States Treasury Annex at Washington, D. C.

GENERATING UNIT.—Bids will be received at Ponca City, Okla., on Oct. 23, for material and equipment for light and water plant. The specifications include furnishing and erecting complete one steam engine direct-connected to approximately a 475-kv.a. generator, and for purchasing from the city one 75-kw. and one 100-kw. direct-connected unit now operating in the above plant. Address W. H. McFadden, mayor. Burns & McDonnell, engineers, Kansas City, Mo.

INCORPORATIONS

ATLANTA, GA. — Simplex Farm Light & Pump Co. has incorporated with a capitalization of $50,000. Rollin W. Hutchinson, Jr., Egbert Allen, and others are the incorporators.

PRESTONBURG, KY. — Eastern Kentucky Service Co.; capital, $5000. To manufacture electrical specialties, etc. W. S. Wells is the principal incorporator.

PALM BEACH, FLA.—Palm Utilities Co.; capital, $50,000. To operate a local plant for the generation and distribution of electric energy. Incorporators: A. Blair Ridington, George A. Lowry, and F. L. Ridington.

NEW YORK, N. Y.—Hot Flo Faucet Corp.; capital, $50,000. To manufacture electrical supplies, etc. Incorporators: S. O. Simons, H. Frantzen, and H. Remington, 302 West 102nd St.

PITTSBURGH, PA. — Pittsburgh Generator Co.; capital, $50,000. To manufacture generators, etc. Incorporators: F. Giles, M. M. Clancy, and J. J. Kennedy.

SPRINGFIELD, TENN. — Orlando Water & Light Co.; capital, $10,000. To operate a local plant. Incorporators: W. W. Gilbert, J. W. Drake, and V. E. Crocker.

CLAY, W. VA.—Clay Utility Co.; capital, $10,000. To operate a local plant for the generation, distribution, etc., of electric energy. Incorporators: S. W. Bryant, S. S. McLane, and W. S. Pierson.

CLEVELAND, OHIO.—Sebillo Oxygen Manufacturing Co. has been incorporated with a capital of $10,000, by Charles B. Bayly, Clinton De Witt, M. C. Haugh, F. M. Selbard, and Alexander L. Chtostergi.

LOUISVILLE, KY.—The Louisville Bridge & Terminal Company has filed articles of incorporation showing capital stock of $5,000,000. The company is a consolidation of the Louisville Bridge & Railroad Company, capital stock $1,000,000, which owns the Pennsylvania railway bridge over the Ohio river and the Pennsylvania Railroad Terminal Company, capital $2,000,000, owning the terminal properties of the Pennsylvania railroad in Louisville. The additional capital is to cover improvements on the Jeffersonville (Ind.) side of the river, such as extensive yards, roundhouse, repair shops and other buildings necessary to a city terminal.

DOVER, DEL.—Electric Kitchenet Company. Capital, $500,000. To manufacture electrical specialties. Incorporators: M. L. Rogers, L. A. Irwin, and W. G. Steigler, Wilmington.

NEWPORT NEWS, VA.—Electric Welding Company. Capital, $50,000. To operate a general electrical welding establishment. Incorporators: William Schenstrom, Charles H. Peoples, both of Brooklyn, N. Y., and K. B. Johnson, Norfolk, Va.

BOERNE, TEX.—Boerne Light & Ice Company has been incorporated with a capital of $10,000 by J. J. North and L. H. Rowden.

Recent Patents

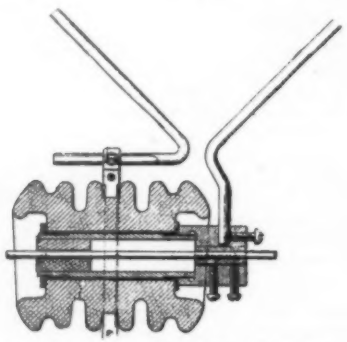
Selected and Summarized by Albert Scheible, Patent Attorney, 79 West Monroe Street, Chicago, Illinois

A series of brief comments on some of the recently issued electrical patents which appear to be of particular interest to our readers, the number after each heading being that of the United States patent to which the summary relates. Any correspondence regarding such patent matters should be sent direct to Mr. Scheible at the above address.

Cooling Collector Rings (1,277,783).—Wilhelm R. Uggla (of Finspong, Sweden) provides the collector rings of a dynamo with holes parallel to the shaft, and with wings on each ring facing the other ring, so that these wings cause air blasts.

High-Potential Insulator (1,277,304).—Bela Gati (of Budapest, Hungary), makes the body of his insulator of insulating material with its under surface shaped in accordance with the principles of electrostatic strain. Then he covers the insulator with a metal water-shedding hood.

Lightning Arrester (1,277,978). James F. Martin and Henry N. Mueller (both of Pittsburgh, Pa.) mount a piece of iron pipe on the live wire. This directly carries an insulator and one of the arcing terminals, while the other horn terminal is clamped upon the insulator.



No. 1,277,978.—Lightning Arrester.

Cartridge Fuse (1,277,880).—Louis W. Downes, of Providence, R. I., provides a transverse sight hole in the center of his cartridge fuse.

Distance Temperature Apparatus (1,277,464).—A temperature-recording apparatus employing an electric transmitting circuit. Patent assigned by Harry Y. Norwood and Fred W. Stalker, of Rochester, N. Y., to the Taylor Instrument Companies.

Liquid Rheostat (1,277,495).—To cool the liquid, Karl A. Simmon (of Edgewood Park, Pa.) circulates a small part of it continuously through an auxiliary cooler, from which it returns to the rheostat.

Magnetic Iron Product (1,277,523 and 1,277,524).—This name is given by Trygve D. Yensen (of Swissvale, Pa.) to a product containing at least 99.7 per cent degassified iron and having a saturation intensity of magnetization ranging between 1750 and 1850. To produce it, he reduces the manganese, sulphur and phosphorus content of a low-carbon iron to less than one-twentieth of one per cent, and refines this by melting it in a vacuum.

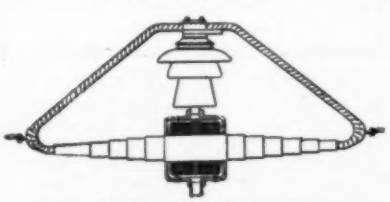
X-Ray Protective Cement (1,278,010).—For obstructing X-rays, Paul Poetschke (of Milford, Del.) uses two parts of lead carbonate, one part of a cement-forming powder, and enough liquid to make the mixture plastic.

Metallic Conduit (1,277,550).—An arrangement of two-piece channels with arched side positions that snap on one another. Patent assigned by Andrew J. Connell (of College Point, N. Y.) to the Empire Art Metal Co.

Electrode for Arc Soldering (1,277,639).—Antoine B. Pescatore (of London, England) wraps iron or steel wires around one another and covers them with a slag-forming material, thereby causing the arc to travel around the edge of the electrode.

Electric Heater (1,277,657).—A tube is filled with granular resistance material spaced by a number of partitions, so that the lower granules do not have to carry the weight of the upper ones. Patent assigned by Wm. Hogg Smith, of Falkirk, England, to the Filbar Electric Heater, Ltd., of London, England.

Series Transformer (1,277,384).—The transformer core described by Lewis W. Chubb, of Edgewood Park, Pa., in this patent (assigned to the Westinghouse Electric Mfg. Co.) is a nickel-iron alloy with over 29 per cent nickel, or nickel in excess of that contained in the nonmagnetic nickel-iron alloys.



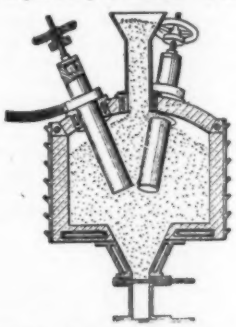
No. 1,277,384.—Series Transformer.

Making Sodium Cyanide (1,277,898 to 1,277,900).—Three patents assigned by Horace Freeman (of Niagara Falls, N. Y.) to the American Cyanamid Co. They relate respectively to a process for producing this chemical, to a crude form of this product, and to an electric furnace suitable for its production.

Retarded Solenoid (1,278,189.)—The core moves in the axis of the solenoid and causes a screw to move along with it so that the load rotates with the screw. This patent to Albert T. Marshall has been assigned to the Automatic Refrigerating Co., of Hartford, Conn.

Sterilizing Apparatus (1,277,378).—In the apparatus designed by Ralph E. Case (of South Norwalk, Conn.) a purifying chemical is fed into the conduit through which the liquid passes, the chemical being produced electrolytically in proportion to the flow of the liquid which is to be sterilized.

Calcining Coal (1,277,707).—To calcine coal at high temperatures, Waldemar Dyrssen, of New York, uses an electric furnace with electrodes imbedded in the coal, and adjusts the distance between the electrodes to keep the voltage constant.



No. 1,277,707.—Electric Furnace for Calcining Coal.

Electric Orchestrion (1,277,813).—In this patent of Lenore Zuehlke, Hortonville, Wis., there is included a note sheet and tracker bar, a set of bellows, and electromagnetically operated sounding bodies.

Renewable Cartridge Fuse (1,278,110).—In this renewable fuse patented by Henry M. Cogan, of Brooklyn, N. Y., each end of the fuse element is clamped between the end ferrule and a screw-tightened block.

Electrically Operated Revolving Door (1,278,145).—A revolving door of the type having four radial wings is operated by means of an electric motor, the control for which is governed by the closing of contact parts carried by each wing. Pressure on any of these contact points starts the motor and the latter turns the door until pressure on the contact is released. This patent to Edward C. Haviland, has been assigned to the Van Kannel Revolving Door Co., of New York City.

Frequency Meter (1,277,757).—A magnetic-vane type instrument. Patent assigned by Burchard P. Romain to the Weston Electrical Instrument Co., of Newark, N. J.

Men in Service

Thomas J. Litle Serves on Welding Research Committee—H. C. Deffenbaugh Commissioned Lieutenant—Honor Rolls

ROBERT M. SPEARS, chief clerk of the chief operating engineer's office, Commonwealth Edison Co., Chicago, has entered the Student Officers' Training Corps at the University of Illinois.

O. VON VOIGTLANDER has closed his office as consulting industrial engineer in Jackson, Mich., for the period of the war and accepted a commission as caption of engineers, U. S. Army, reporting at Camp Humphreys, Virginia.

WALTER F. JAY, for the past 13 years associated with the Power Specialty Co., Dansville, N. Y., has resigned to accept the position of production engineer, Production Division, War Department, Rochester District Ordnance Office.

H. C. DEFFENBAUGH, for the past year assistant to the secretary of the Empire State Gas and Electric Association, was recently commissioned first lieutenant, corps of engineers, searchlight section, 56th Engineers, Washington barracks, Washington, D. C.

MAJOR J. W. HUBBELL, after a year of active service overseas, has been ordered to this country to become a division signal officer of one of the new divisions in training. For the present he is detailed to the Army Staff School at Washington, where he will remain for about five weeks. Previous to his enlistment in Government service, Major Hubbell was connected with the engineering department of the Bell Telephone Co. of Pennsylvania.

THOMAS J. LITLE, engineer of the the Lincoln Motor Co., Detroit, Mich., has been appointed a member of the Welding Research Committee of the Emergency Fleet Corporation, U. S. Shipping Board. Mr. Litle has been closely investigating both gas and electric welding conditions in the American plants constructing Liberty engines, and his appointment will be helpful in effecting an interchange of data between the aircraft and shipbuilding industries. This appointment does not affect Mr. Litle's connection with the Lincoln Motor Co.

DANIEL E. MOORE, formerly connected with the Chicago Telephone Co., has been promoted to the rank of major and has been given command of the 419th Telegraph Battalion. Major Moore is a graduate of the Armour Institute of Technology and had been in the Chicago telephone organization for ten years. He was equipment engineer assigned to work for the suburban division. When war was declared Mr. Moore was appointed a first lieutenant with the Sixth Telegraph Battalion and placed in Company E under command of Captain Richard Walsh. After this battalion had been training for a short time Lieutenant Moore was detached from line service and made an instructor in the Officers' Training School for Signal Corps at Leon Springs, Texas. While in this important work he was promoted to the rank of captain.

ROLL OF HONOR.

The electrical industry, perhaps to a greater extent than any other industry, has answered the call of the Nation for Men. As this is a war of engineers, naturally the technically trained men in the electrical industry have been in great demand and they have responded with splendid patriotism. Many of the large utility and industrial corporations have assigned men for Government service aside from those who have voluntarily entered or been called for service.

THE ELECTRICAL REVIEW *will welcome news concerning men who have entered the service or who are engaged in any patriotic duties.*

BELL TELEPHONE COMPANY of Pennsylvania has added 67 names to its roll of honor since September 1, bringing the total of its men in service to 1211.

RAYMOND BURNHAM, formerly connected with Fairbanks, Morse & Co., Chicago, has been commissioned a captain in the Engineer Officers' Reserve Corps.

P. L. SPALDING, formerly vice-president and general manager and more recently president of the New England Telephone Co., has been promoted to the rank of colonel.

SOCIETY OF AUTOMOTIVE ENGINEERS reports that 38 members have recently entered the services of the Government, 27 of whom are in military service and 11 are serving in civilian capacities.

J. M. STEELE, who has been in the employ of the Columbia Gas & Electric Co., has resigned his position to become connected with the sugar division of the United States Food Administration at Columbia, S. C.

SERGEANT J. D. BECKEL, formerly a commercial representative of the Bell Telephone Co. of Pennsylvania at Connellsville, was wounded July 28 in the battle of the Marne. He is a member of Company D, 110th Infantry, which has seen such valiant service in the "big drive."

NATIONAL LAMP WORKS of the General Electric Co., Cleveland, now has 440 stars on its service flag, which number includes several women who have gone to the front as nurses. It comprises all divisions and departments of the National Lamp Works. Practically every branch of the service, including army, navy, marines, aviation and medical corps are represented. Four blue stars on the service flag have been changed to gold in memory of its four men who have made the supreme sacrifice. These were Robert T. Coughlin, Enoch Brooks, Harry Peffer and Noble Lintz.

ELECTRIC APPLIANCE CO., with main offices in Chicago, now carries on its roll of honor the names of 56 employes enlisted in either the Army or Navy. Of this number 27 are from the Chicago office, 14 from San Francisco, 8 from Dallas, and 7 from New Orleans.

CHARLES M. ROGERS, who has been results engineer for the Southern district of the H. L. Doherty organization for a number of years, is now a member of the Government dollar-a-year forces. He has the title of fuel oil engineer of the Gulf Coast district, with headquarters at New Orleans.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS in the October number of *Proceedings* records the names of 57 members who are now in army and navy service with the United States and her allies. A total of 1060 members of the American Institute are enlisted in the allied cause, and among these are many who have gained commissions of high rank.

SAMUEL FERGUSON, vice-president of the Hartford Electric Light Co., Hartford, Conn., has been appointed state director of the department of non-war construction of the Connecticut State Council of Defense. Through local representatives, Mr. Ferguson will handle for the council the applications for permits of persons contemplating building operations which may be allowed under the few exceptions to be made by the Federal Government. If the proposed construction seems essential, Mr. Ferguson will recommend to the War Industries Board that a permit be granted.

Obituary.

LIEUT. BRITT JOURNEY, with Company H, Thirtieth Infantry, 82d Division, and prior to his enlistment district traffic chief of the Southern Bell Telephone & Telegraph Co., with headquarters at Raleigh, N. C., is the first employe of that company to make the supreme sacrifice for his country, having been killed in action in France on August 11.

The first of the twenty-eight stars in the service flag of the ELECTRIC STORAGE BATTERY COMPANY, Chicago, which hangs in the Marquette Building, indicating the men who have entered the service of their country from the Chicago office of that organization, has been turned to gold due to the sudden death of Theron Pardee, who resigned from that company on July 15 and entered the Officers' Training Corps at Columbus Barracks, Ohio, and was afterwards transferred to the Engineers' Officers' Training School at Camp Humphreys, Virginia. He succumbed to an attack of pneumonia on October 5 and his body was sent to Chicago under military escort for the funeral services which were held on Oct. 10. He was a graduate of Lewis Institute, Chicago, and has been in the service of the Electric Storage Battery Co. for three years, traveling part of that time in Illinois, and latterly being in charge of automobile battery sales.

Personal

H. C. Brown Joins Bryant Electric—H. C. Newkirk Made Chicago Representative L. K. Comstock Co.—Changes

W. A. MARSDEN, for several years connected with the sales department of Pacific States Electric Co., Seattle, has entered the employ of A. H. Cox Company, that city, as electrical engineer.

ROBERT A. BACHMAN, Allentown, Pa., recently connected with the Edison Storage Battery Co., West Orange, N. J., in the capacity of vice-president and general manager, has been engaged in an executive capacity by the Wright-Martin Aircraft Co., Long Island City, N. Y.

W. W. TEMPLIN, specialty sales manager, Western Electric Co., has taken up special work in the Government department. W. D. Lindsay will, in addition to his duties as assistant advertising manager, be in charge of the work formerly handled by Mr. Templin.

FRANK G. FROST, formerly general superintendent of the Houston Lighting & Power Co., Houston, Tex., has accepted the position of superintendent of power for the New Orleans Railway & Light Co., New Orleans, La., both of which companies are subsidiaries of the American Cities Companies.

JOHN A. DEWHURST has resigned his position as schedule superintendent with the Twin City Rapid Transit Co., Minneapolis, to take up engineering work with the firm of Day & Zimmerman, Inc., Philadelphia, Pa. Previous to his connection with the Twin City Rapid Transit Co., Mr. Dewhurst was with the General Electric Co., in the railway and traction engineering department.

P. S. KLEES, for the past 12 years associated with the Franklin Electric Co., New York City, has been appointed vice-president and sales manager. Mr. Klees has been identified with the lamp field for twenty years and is a very active member of a number of important committees in lamp industry. He is a member of the N. E. L. A., Illuminating Engineering Society, the Manufacturers' Association and the Jovian Order.

H. C. NEWKIRK has been appointed as representative of the L. K. Comstock Co., electrical contractor, in charge of the Chicago office, succeeding E. E. Van Cleef, who is now connected with the Washington (D. C.) office of the company. Mr. Newkirk has been identified with the Chicago branch of the Comstock company for the past three years, coming there from the New York office. Previous to his association with this concern, he was connected with the Charles C. Knox Co., of New York. While in the employ of the latter firm he superintended the electrical construction of the famous Woolworth building in New York. Mr. Newkirk is at present in charge of the construction of a number of large munition plants, the electrical work of which is being performed by the Comstock company.

A. T. BULL, electrical engineer, Pittsburgh, Pa., recently visited Seattle and other Pacific coast cities on consultation work.

W. J. DUFFY has been appointed accountant at the Eureka (Cal.) division of the Western States Gas & Electric Co., succeeding N. A. MacMillan who has accepted a position as cashier in one of Eureka's largest banks.

M. A. CURRAN, formerly manager of the line material department of the Western Electric Co., has been appointed assistant manager of the Philadelphia House. G. F. Hessler will be in charge of the work formerly handled by Mr. Curran.

J. W. STICKNEY, who was for several years general manager of the Indiana branch of the Central Union Telephone Co., has joined the staff of Nordyke & Marmon Co. in Indianapolis as head of the employment and welfare department. Mr. Stickney retired as general manager of the Central Union branch last June and since that time has been doing special advisory work for the receivers of the company.

HARRY C. BROWN, whose resignation as secretary of the National Association of Electrical Contractors and Dealers was noted in a recent issue of the ELECTRICAL REVIEW, has become associated with the Bryant Electric Co., Bridgeport, Conn. Mr. Brown will assume his new duties Nov. 1 and will act as assistant to Frank Burton, general sales manager of the company.

C. E. HAYGOOD, manager of the railway department of the Manila Electric Railroad & Light Co. of Manila, Philippine Islands, is visiting the United States on a vacation and for the purpose of consulting with the officers of the J. G. White Management Corp., New York, N. Y., the operating managers of the Manila company. He expects to return to the Philippines sometime before the first of the year.

THOMAS N. MCCARTER, president of the Public Service Corp. of New Jersey, Newark, N. J., and H. C. DONECKER and M. R. BOYLAN, assistant general manager and general auditor of the company, respectively, have started on a trip which will include the cities of Pittsburgh, St. Louis, Milwaukee, and Cleveland, to study the fare zoning system in the first three cities, and the pay-as-you-leave method in effect in the last mentioned city.

Obituary.

ELY M. NORRIS, of Morristown, N. J., for the past five years superintendent of the test department at the Edison Storage Battery Works, West Orange, N. J., died on Oct. 6, at the Morristown Hospital, of pneumonia. Mr. Norris was 27 years of age.

ROBERT B. COREY, president of the R. B. Corey Co., passed away at his home, 930 Hillside avenue, Plainfield, N. J., on October 7, and in his death the electrical industry sustains the loss of a well-known sales pioneer. Mr. Corey was born in Elmira, N. Y., July 2, 1861. He entered Yale University in 1892, but left before graduating to join his father, who was engaged in the banking business in Bradford, Pa. In 1899 he became general manager of the Electrical Construction Supply Co., when he developed and successfully placed on the market the Ward constant potential arc lamp. In addition to his connection with the R. B. Corey Co. as president, he was also president of the American Iron Scale Co. Mr. Corey was a member of the Engineers' Club, Machinery Club, Plainfield Country Club, Sea View Golf Club, Building Trades Employers' Association and Merchants' Association. The deceased is survived by his widow, mother and sister.

Robert B. Corey.

CHARLES G. ROEBLING, president of John A. Roebling's Sons Co., Trenton, N. J., died at his home in Trenton, Oct. 5, at the age of 69 years. Mr. Roebling was graduated from the Rensselaer Polytechnic Institute with the degree of civil engineer in 1871. Mr. Roebling was for a number of years mechanical engineer of the John A. Roebling's Sons Co., and to him is largely due the remarkable growth of the great insulated wire works of the company, one of the most extensive in the United States. In 1881 he was engineer of the machinery and contractor for the removal of Cleopatra's Needle from Alexandria, Egypt, to Central Park, New York. He assisted his brother, Washington A. Roebling, in the construction of the Brooklyn Bridge, the plans for which had been drawn by his father, John A. Roebling. Mr. Roebling was a man of broad interests, and was the founder of the town of Roebling on the Delaware, designed originally to give comfortable homes to the thousands of employes working in the wire and steel mills.

After the War, What?

VII.

Germany Says

Nothing would please the German propagandist more than to have all of the advertised trade names and trademarks in the United States disappear for the period of the war.

Germany intended all the time that this should be a battle for the world's trade. On the part of our chief national enemy, this is a commercial war, backed by the strongest military party on earth. German business was easily talked into a belligerent frame of mind by German militarists. Germany's principal aim is two-fold—to acquire territory, and to dominate trade in as many countries as it can bring under its influence, by force, by treaty or by a semblance of friendship.

An unbroken display of confidence, through advertising, is needed in the way of national defense.

No doubt Germany believes that we are not equal to the situation, and that we are going to falter in this crisis. This is shown in the following absurd statement which is said to have appeared in the Berlin Tageblatt:

> "If the despised Yankee nation think they are going to win the war and force Germans out of foreign markets, there is nothing to indicate this sentiment in their local and foreign advertising. Many of their advertising agencies have closed their doors through lack of patronage. The much-talked-of captains of industry have canceled advertising contracts everywhere. Germany and German merchants have increased their advertising space in neutral markets and at home. It pays to advertise in war as well as in peace. The far-seeing merchant never stops advertising."

This assertion regarding American advertising is grossly exaggerated, and it applies particularly to foreign trade; nevertheless, it shows what Germany would like to see happen in the United States.

But American business men will "keep the home fires burning."

A. L. GALE.

WHO is not for us is against us. Following are a few facts for patriots to ponder—taken from "War Time Advertising," copyright by Critchfield & Co., Brooks Bldg., Chicago. Send for a copy.

INTERNATIONAL TRADE PRESS, Inc.
C. A. Tupper, President . CHICAGO

Financial News

Relative Importance of Public Utility Financing.

The relative importance of the financing requirements of public utilities is shown by the amount of bonds, notes and stocks issued by railroad, industrial and public utility corporations during the first nine months of 1918. These figures, compiled by the Wall Street Journal, represent the securities issued through the ordinary channels—investment banking houses—and offered to private investors. They are as follows:

	Bonds.	Notes.	Stock.	Total.
Railroad	$ 45,078,100	$ 49,586,000	.....	$ 94,664,100
Industrial	92,795,000	167,966,000	$125,045,225	385,806,225
Public utilities	137,175,000	248,482,900	14,387,200	400,045,100
Total	$275,048,100	$466,034,900	$139,432,425	$880,515,425

Valuation Plan for North Dakota Utilities.

The most significant movement affecting public utilities and the owners of utility securities since the birth of the Wisconsin commission idea is that launched by the state administration of North Dakota contemplating the valuation by the state of every utility property within its boundaries, to determine a basis for tax assessments and service charges.

It is the first systematic attempt ever made to make sure that taxes are assessed on the same valuation the companies are permitted to use as a rate making basis on which they are allowed a given return. Thus one of the two great evils which have kept utilities in politics will neutralize the other. If the company comes into court to complain that its valuation is placed too high for taxation purposes it may be reduced, but the reduced valuation will be used as the amount on which the company will be permitted to earn a return when the rate question arises.

The valuation is being made for the state tax commission and the railroad commission, the latter being the equivalent of a state utilities commission. The state has employed Hagenah & Erickson, as the engineers, to make the valuation. Physical property in practically all of the companies in the state has been valued and the accountants are beginning on the books of the company.

When the valuations have been fixed by the engineers the companies will be given an opportunity to come in for a hearing and ask that the valuation be increased or decreased. They will be heard both as to taxes and rates, and then an official state valuation will be announced. Thereafter the valuation will increase or decrease as state engineers give companies credit for additions and betterments and charge off depreciation.

Western Union to Receive $8,000,000 Annually.

Under an agreement between the Post Office Department and the Western Union Telegraph Co., the Government agrees to pay all interest on outstanding bonds of the company, all dividends and interest payments due on stocks and bonds of subsidiary companies, all taxes and operating charges on the property, and in addition $8,000,000 annually. This sum insures the present rate of dividend on the company's stock.

Dividends.

Public Service Co. of Northern Illinois has declared a quarterly dividend of 1¾ per cent on preferred stock, payable November 1 to stock of record October 15.

Havana Electric Railway, Light & Power Co. has declared a semiannual dividend of $3; also a semiannual dividend of $3 on preferred stock, both payable November 15 to stock of record October 25.

Earnings.

QUEBEC RAILWAY, LIGHT, HEAT & POWER.

The Quebec Railway, Light, Heat & Power Co., Ltd., reports for the year ended June 30, 1918, gross earnings from operation of $1,797,852, a decrease of $34,-179. After adding miscellaneous income of $230,088 the total revenue from all sources amounted to $2,027,941, a decrease of $34,951. Operating and maintenance expenses were $1,233,124, an increase of $79,955. The surplus after fixed charges and taxes amounted to $95,306. The balance sheet as of June 30, 1918, shows cash on hand and in banks of $97,036, accounts and bills receivable $676,208, bills payable, $241,649, accounts payable, etc., $558,937, surplus, $753,091, and total assets and liabilities of $23,973,069.

MISSISSIPPI RIVER POWER.

For August—	1918.	1917.
Gross	$192,703	$173,467
Net after taxes	158,383	144,792
Surplus after charges	37,872	22,856

PHILADELPHIA COMPANY.

For August—	
Gross earnings	$2,003,054
Net earnings	700,981
For 5 months—	
Gross earnings	10,155,387
Net earnings	1,588,527

DAYTON POWER & LIGHT.

	August, 1918.	August, 1917.	8 months ended August 31, 1918.	8 months ended August 31, 1917.	12 months ended August 31, 1918.	12 months ended August 31, 1917.
Gross earnings	$185,154	$135,194	$1,482,310	$1,163,357	$2,199,572	$1,766,211
Operating expenses (including depreciation and taxes)	127,417	94,676	1,042,319	793,389	1,515,475	1,228,534
Net earnings	$ 57,737	$ 40,518	$ 439,991	$ 369,968	$ 684,097	$ 537,677
Non-operating revenue	2,398	395	20,815	5,408	25,740	7,734
Total income	$ 60,135	$ 40,913	$ 460,806	$ 375,376	$ 709,837	$ 545,411
Interest on bonds	$ 32,192	$ 15,121	$ 224,745	$ 121,137	$ 285,227	$ 181,954
Other deductions (includes other interest and sinking fund)	11,850	9,809	93,851	81,363	136,846	108,344
Total deductions	$ 44,042	$ 24,930	$ 318,596	$ 202,500	$ 422,073	$ 290,298
Net income	$ 16,093	$ 15,983	$ 142,210	$ 172,876	$ 287,764	$ 255,113
Dividends on preferred stock	14,909	14,813	118,633	118,500	177,883	177,750
Surplus	$ 1,184	$ 1,170	$ 23,577	$ 54,376	$ 109,881	$ 77,363
Operating ratio	68.81%	70.03%	70.34%	68.20%	68.88%	69.55%

WEEKLY COMPARISONS OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

Public Utilities—	Div. rate. Per cent.	Bid Oct. 8.	Bid. Oct. 15.
Adirondack Electric Power of Glens Falls, common	6	13	13
Adirondack Electric Power of Glens Falls, preferred	6	..	..
Amrican Gas & Electric of New York, common	10+extra	79	80
American Gas & Electric of New York, preferred	6	39	39
American Light & Traction of New York, common	..	192	196
American Light & Traction of New York, preferred	6	91	92
American Power & Light of New York, common	4	40	40
American Power & Light of New York, preferred	6	68	68
American Public Utilities of Grand Rapids, common	..	..	..
American Public Utilities of Grand Rapids, preferred	6	35	35
American Telephone & Telegraph of New York	..	105½	108
American Water Works & Elec. of New York, common	..	4½	5¼
American Water Works & Elec. of New York, particip	7	11	12
American Water Works & Elec. of New York, first preferred	..	57	59
Appalachian Power, common	..	3	3
Appalachian Power, preferred	7	20	20
Cities Service of New York, common	+extra	230	250
Cities Service of New York, preferred	6	73½	74
Commonwealth Edison of Chicago	8	108	108
Comm. Power, Railway & Light of Jackson, common	..	21	23
Comm. Power, Railway & Light of Jackson, preferred	6	49½	45
Federal Light & Traction of New York, common	..	7¼	7¼
Federal Light & Traction of New York, preferred	..	35	35
Illinois Northern Utilities of Dixon	6	..	..
Middle West Utilities of Chicago, common	2+extra	25	26
Middle West Utilities of Chicago, preferred	6	43	46
Northern States Power of Chicago, common	..	44	46
Northern States Powef of Chicago, preferred	ex.div.7	80	81
Pacific Gas & Electric of San Francisco, common	..	35	36½
Pacific Gas & Electric of San Francisco, preferred	6	78¼	80
Public Service of Northern Illinois, Chicago, common	7	76	80
Public Service of Northern Illinois, Chicago, preferred	6	78	84½
Republic Railway & Light of Youngstown, common	4	17	17
Republic Railway & Light of Youngstown, preferred	6	55	55
Standard Gas & Electric of Chicago, common	..	4½	5
Standard Gas & Electric of Chicago, preferred	6	20	24
Tennessee Railway, Light & Power of Chattanooga, common	..	2	2½
Tennessee Railway, Light & Power of Chattanooga, preferred	6	10	11
United Light & Railways of Grand Rapids, common	4	28	29
United Light & Railways of Grand Rapids, preferred	6	61	60
Western Power of San Francisco, common	..	11	11
Western Power of San Francisco, preferred	6	48	48
Western Union Telegraph of New York	extra	90	92
Industrials—			
Electric Storage of Philadelphia, common	4	49½	49½
General Electric of Schenectady	8	150	157
Westinghouse Electric & Mfg. of Pittsburgh, common	7	42½	44½
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	59	60